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AIDS TO EFFICIENT SPACE HEATING

A VERY large proportion indeed of the fuel that is burnt in this country is used for space heating. Britain is pre-eminently a country wherein one must keep warm to be able to work properly. Its dank and dull climate, in which the sun shines fitfully and with a watery radiance, seems to cause greater demands for cheerfulness and warmth in indoor heating than are needed in many other countries in which the air temperature may be colder. While it is impossible to state with any assurance how far our coal is used for space heating, since the published consumption of many industries is partly used for that purpose, it would not surprise us to find that at least half our fuel is used in this way. Every effort must, therefore, be made to encourage the efficient use of fuel for this purpose, and anything that will assist in this must be welcomed. The London and Counties Coke Association decided in 1937 to carry out tests to determine whether the American practice of using "degree days" as an aid to forecasting the fuel consumption of buildings and in checking the efficiency of heating systems was applicable to this country. The results were sufficiently encouraging to persuade the Association to adopt this system and to issue to its members and friends in the London area a regular series of degree day reports. This service was perforce suspended during the war since there were no data on which to base it. It is understood that it has now been re-established. The Association has lately issued an informative booklet entitled "Degree Days; their Use and Application for Checking and Computing Fuel Consumptions" which should be of great value in removing misconceptions from the minds of semi-technical persons who may endeavour to use the data supplied for wrong purposes.

The heat required for space heating depends on many things. First, it depends upon the temperature at which the space is to be kept. That in turn depends upon what sort of work is to be done in that space and on whether there are many persons at work there or only few. Major Markham in his book: "Climate and the Energy of Nations," has put forward a theory, supported by a good deal of evidence, that civilization depends upon maintaining an effective isotherm of 70°F. He has pointed out that ancient civilizations flourished around this isotherm and were not able to spread to lands far outside a narrow zone north and south of this isotherm until man was able to control his temperature by the extensive use of fuel. It is an established fact that around 70°F. is the ideal temperature at which the human race develops the greatest energy. This is important, because, as Emerson has said, "The man of energy sees opportunities and ways where others see none." The human being, kept in too hot an atmosphere develops inertia and laziness, in confirmation of which suggestion, Major Markham has pointed to the "poor whites" that create so serious a problem in certain hotter climates; the same things happen when the temperature falls too low. Hence, the maintenance of the correct temperature for working may be highly important. It is quite true that a great deal of fuel can be saved by reducing the temperature of offices and workshops by 5°F.; but is this not penny-wise-and-pound-foolish? Should we not maintain our temperature at that degree at which we can do our best work? This principle is doubly important in the many countries, including Britain and much of Europe, where the food is poor, the population under-nourished, and the nation bankrupt.

RATIONAL ARGUMENT

IT may be well if we hasten to add that it must not be deduced from this argument that our offices, workshops, and private houses should be maintained at 70°F. air temperature. The 70°F. is the temperature next the skin. We can partly maintain this temperature by means of insulation—*i.e.*, clothes—and our objective must be just that. Experience seems to suggest that a room temperature of 65°F. for sedentary work enables the temperature next our skins when wearing normal clothes to be 70°F. When doing manual work, we generate more internal heat and therefore the room temperature can be and should be lower than 65°F. The degree day booklet to which we have referred is based upon an internal room temperature of this figure of 65°F.

The amount of heat required for space heating depends upon the construction of the building, and of course on its size. It is not necessary here to go into the many factors which govern the flow of heat from the interior of a building to the atmosphere. The rapid conduction of heat through windows suggests that many of the new almost-all-glass factories will be very expensive in fuel unless they are provided with double windows. The use of corrugated iron and other flimsy uninsulated structures is very wasteful of heat. The amount of heat that can escape from the roof of a building is far greater in general than that which escapes from the walls. There is usually a rising temperature gradient from floor to roof, and this in turn assists in the dissipation of heat. Then, again, an air-conditioned building should lose less heat than one in which the windows are opened and air discharge into the atmosphere is encouraged. A workshop fitted with large doors which must frequently be opened to admit railway wagons or other large bodies will require more heat than one which is kept closed. The human body gives off about as much heat as a gas burner

consuming 5 cu.ft. an hour, so that the number of persons present per square yard of floor space will have a great deal to do with the heat requirements. All these and other considerations show how difficult it is to apply degree day data based on one building to another building. The task of those who would produce a simple method of guiding the non-technical or semi-technical fuel salesman is thus extremely complex. Those who have developed the degree day conception are to be congratulated on the amount of assistance they have been able to bring to the harassed salesman and to those who have to assess the working results of central heating equipment. But perhaps the most valuable parts of the publication here under discussion are those in which the limitations of the method are set forth. After reading this booklet, there is no excuse for those who deceive themselves by using degree days for purposes for which they were never intended and to which they do not apply.

WHAT A "DEGREE DAY" IS

THERE is no object in recounting here the information that is contained in this booklet, since the booklet itself can be purchased for the modest sum of 3s. from the Association and studied in detail. It is sufficient here to record what a degree day is and how it should be used. On the assumption that heat is lost from buildings mainly by conduction—this is not strictly true since much may be lost by air-changes—the amount of heat that escapes and which must therefore be made up by the heating plant will roughly depend on the difference of temperature of the inside of the building and its surroundings. Wind, of course, affects heat loss considerably, but this is neglected. Various activities, including that of the human body, within the building add to the internal heat and in practice it is found that the heat loss from the building is proportional to the number (internal temperature, °F. − 5)—(outside temp. °F.). The expression (internal temp. − 5)°F. is known as the base temperature. A degree day is therefore defined as the product of one day (24 hr.) and 1°F. difference of temperature between the base temperature and the average outside air temperature during the day when this is below the base temperature. The term "degree day" therefore means simply this difference of degrees for one day. The computation of degree-days is quite complicated, as is explained in the report, but that need not concern the user as the Association supplies the calculated figure ready for use.

The primary purpose of degree days is to ascertain whether the fuel used for heating purposes is being consumed efficiently. *If the appliance is efficient in the first place,* and that is a very important reservation, it can be ascertained whether it remains efficient by finding out whether the amount of fuel used per degree day over each successive month remains constant; naturally, some attention must be paid to the quality of the fuel, and this is a point which the booklet might with advantage have emphasized. The plain fact is that a great deal of the increased coal production about which the authorities are boasting is simply due to increased ash content, and that in turn is leading to decreased heating efficiency. Probably more fuel is being wasted to-day from this cause than from all other obvious causes put together. However, the booklet goes on to suggest that by further converting the figure for lb. coke/degree-day into "lb. coke/degree-day/10,000 cu.ft. of heated building space, the degree-day figure can be used for computing "the seasonal heat requirements of another dwelling of similar character and construction." We should not quarrel with this since the writer has been wise enough to specify "dwelling"; one dwelling may be like another in heat requirements. But if the word building had been used, we should have been bound to utter a word of grave warning against putting this idea into the heads of the non-technical salesman; he may make very serious mistakes if the buildings are different in construction, and it is not always evident to the uninitiated that there are differences in construction which will affect fuel consumption. Even in dwelling houses, there will be distinct differences according to the method of building. A house having walls and roof of U = 0.3 will require a very different amount of heat to one built by modern standards with U = 0.15; but the non-technical man cannot be expected to know this. However, it may well be that the degree day conception gives a guide where no guide existed before, and thus the non-technical guess as to probable future fuel consumption will be nearer the mark than it would otherwise have been. Where the figures are of particular value is in estimating future requirements for a building for which the consumption is known for part of the heating season with a known total of degree days. Even here, however, there is a disturbing factor—namely, the state of the weather. Published figures show, for example, that there may be considerable variations in any month from the average, and that in some years the deviation may be plus and in others minus. To some extent this difficulty has been overcome by the Edmunds charts, which must be drawn for each area in the country and used for estimating consumer's requirements in that area only.

LIMITATIONS IN USE

HAVING noted how degree days may with justification be used, it is well to note their limitations. In first place, the inevitable variations to which we have referred make it imperative that they shall not be collected over short periods and regarded as of general application. Daily figures are totally unreliable; weekly figures must be regarded with suspicion; monthly figures should normally be used. Nor can deductions be made from degree day figures where the heating boiler serves other purposes besides space heating—*e.g.*, the provision of hot water for washing and so on. Likewise the charts provided can only be used when the base temperature is (65-5 =) 60°F.; fresh charts must be drawn out for factories heated largely to other room temperatures. Nor should degree day figures be used for deciding the size of a heating installation, because they take no account of peak periods of demand; the size of the installation must clearly be sufficient to cope with maximum demand and not with average demand.

Is there any relation between degree days and the demand for gas? So far degree-days have been used as a tool in the hands of the heating engineer, and the results collected by him have been transposed into a form in which they can be used for certain purposes by the fuel merchant. We have emphasized, as has the booklet under discussion, that properly the degree-day can be used only for space heating and that only for a base temperature of 60°F. The demand for gas, however, varies according to the external temperature. As gas is only consumed in any quantity at night, say between midnight and 6 a.m., for industrial purposes, it may be necessary to exclude certain hours from the computation of degree days for gas consumption. The arguments we have here put forward are all against any such extension of the idea, but the data exist by which a statistical analysis could be worked out, and it seems to us possible that some positive value might be derived from such an analysis made by statisticians for a number of gas undertakings of different character in various parts of the country. It may in time be possible for the meteorological authorities to issue 24 hr. forecasts of probable degree day values for the weather. At present they content themselves with the simple declaration that it "will be mild in the morning and early afternoon, turning cool in the evening and very cold at night." It is not a far cry to convert these probabilities into probable temperatures extending over probable durations of time;

hence the degree day might be forecast and this could then be applied directly to at least a large part of the load of any gas and electricity undertaking.

All this may appear to the purist to be a little unscientific, a little tinged, or polluted, with wishful thinking. What we have in mind, however, is that when the Gas Industry is re-organized into larger regional units, the forecasting of probable consumption in advance is likely to become of considerable importance. Might it not be worth while working on the statistical analysis in collaboration with the Meteorological Office to see what can be done towards forecasting probable consumption through this conception of degree days applied to a certain fraction of the load, a fraction which will presumably be a known proportion of the domestic load, and will only include a small fraction of the industrial load?

THE COAL SITUATION

RECENT months have been fraught with increasing concern for the Gas Industry as coal stocks have dwindled and the prospects of maintaining gas supply have become increasingly problematical. It was, therefore, with a feeling of hope, not altogether untinged with the presentiment of impending disaster that bitter experience has bred in us, that we attended an interview last week given by Sir Stafford Cripps on the fuel situation. Our fears were not justified—but then neither were our hopes.

Briefly, the position is this: supreme priority is being given to the electrical industry; gas is "to be maintained"; a cut of one-fifth will be imposed upon coke ovens and iron and steel works; and other industries will receive allocations according to their estimated importance.

The present position of coal supply may not be assessed with the lucid accuracy that is desirable. According to Government figures, despite a decrease in labour of 3,400 on the force employed during a comparable period last year, an increase of 170,000 tons of coal per week is being mined. On the face of it, the increase is a substantial one, but, in view of the phenomenal shortage, it is necessary to enquire, and enquire closely, where it is all going. Some indication of the factors resulting in increased demand was given by Sir Stafford when he spoke of the new factories which have appeared in recent months, and the increased strain upon generating plants, induced by lack of replacement and overhaul during the war years, which often results in an output of power relating unsatisfactorily with the consumption of coal. The division of supplies in terms of consumption were given in thousands of tons per week as: electricity, 650; gas, 530; coke ovens, 400; iron and steel, 200; other uses, 800; domestic, 600; railways, 300. Taking into account the fact that gas and electricity are to be maintained, the quantity of solid fuel which can be cut amounts to some 1,150,000 tons—not a very large amount. This obviously means that luxury industries will have to bear the main weight of enforced economy and will be entirely dependent upon the Government allocations.

The new series of allocations, scheduled to start on January 20, will operate upon what Sir Stafford referred to as a "realistic scale." This means that they will amount to about half the former allocations, but not half the deliveries that have been made. Firms of national importance will be able to apply for additional supplies to be distributed by regional fuel committees.

A heartening note was struck by Mr. Shinwell, who announced that although the total deliveries over the next six weeks will be 87% of the November deliveries, gas and electricity undertakings will have more coal than they have ever had. With this trifling encouragement we must be content, reflecting only on the fact that no mention was made of the quality of forthcoming coal. An increased amount of inferior coal is by no means preferable to the same amount of superior coal.

SULPHATE OF AMMONIA

DURING the war years, for obvious reasons, we had no information about the activities of the British Sulphate of Ammonia Federation, but we are now able to publish extracts from the 26th annual report, which covers the year ended June 30 last, and they make interesting reading. The period under review was the 49th year of propaganda work undertaken successively by the Sulphate of Ammonia Committee, the Association, the Federation, Nitram, Ltd., and Imperial Chemical Industries, Ltd., and although the statistics for the year are to a large extent based on estimates they show a healthy trend. World production and consumption of fertilizer nitrogen were respectively about 26% and 23% below the last pre-war totals, but the United States, which produced 188,000 tons and consumed 332,000 tons in 1938-39, increased its production last year to 520,000 tons, while consumption rose to 611,000 tons. The second largest producer was Chile, which produced 254,000 tons, an increase of 29,000 over the last pre-war year, and consumed 5,000 tons, the same as in successive years prior to the war.

The home agricultural consumption of sulphate of ammonia, which 30 years ago amounted to only 95,000 tons per annum, reached a peak of 665,280 tons in 1943-44. In the following year the consumption was 615,110 tons, and the estimated figure for last year was 553,200 tons, which was still two and a half times as much as in the last pre-war year. Prices charged to British farmers immediately before the war ranged from £7 5s. to £7 14s. per ton according to month of purchase. By agreement with the Ministry of Supply the home prices were increased to meet higher costs of production and distribution, but subsequently the Ministry decided to "peg" prices at the 1940-41 level and to grant producers a subsidy on home agricultural sales to cover increased costs not included in the price, and the scale fixed seven years ago, from £9 10s. to £10 2s. per ton according to month, therefore still operates.

Of the 274,589 tons of sulphate of ammonia exported from the United Kingdom last year, 130,795 tons, or nearly one half, went to India and Burma, whose recorded pre-war purchases from this country never exceeded 66,027 tons. Ceylon took 32,813 tons against its previous record of 18,491 tons. Other principal markets were Australia and New Zealand (23,368 tons), British West Indies (14,454 tons), British Guiana (12,079 tons), all of which were approximately on a pre-war level, and France, a small and intermittent pre-war market which had never taken more than 6,917 tons, which last year purchased 19,981 tons.

The Federation in June last consisted of 179 members, but of these 105 had ceased production, either temporarily or permanently. The agreement between members and the Federation expired in June but was renewed for a further period of 24 years. Only one of the producing members gave notice to determine its agreement, and the total number of members is now 105.

Coal Output and Consumption

Last week, the Ministry of Fuel and Power issued a statement giving provisional figures of coal output and consumption for 1946 and final figures for 1945. The statement shows that production was up by 6,527,300 tons in 1946 compared with 1945, but consumption was also greater by 6,549,500. As anticipated, the amount of coal consumed at gas-works has increased considerably, and the 1946 figure is 22,700,000 tons. The wage earners on the colliery books now number 696,700 compared with 706,400 in 1945, and during 1946 the overall output per manshift was 1.03 ton compared with 1 ton in the previous year. The statement went on to say that the leading feature of the production figures since November last has been an increase of 1,000,000 tons during the Christmas and New Year holiday weeks compared with the corresponding period

of 1945. In the two weeks preceding the Christmas week production touched the highest point since June of 1943, and would have reached the 4,000,000 ton mark but for transport difficulties. On the other hand, as the statement put it, consumption increased alarmingly during the three weeks preceding Christmas, largely due to increase in the use of gas and electricity. We are told that the manpower position in the mines is less menacing than was feared, and that juvenile recruitment has shown a slight increase, but an insufficient one. The over-riding point to bear in mind, as we have pointed out in an Editorial comment in our issue to-day is that output of coal on the tonnage basis, as compared with pre-war days, is not a criterion of the amount of heat contained in the coal. Coal to-day contains far more ash and is correspondingly of less value, in spite of its great increase in price.

The Gas Fund

In the Gas Fund (Contribution) Order, 1947, dated Jan. 2 (S.R. and O., 1947, No. 20), the Minister of Fuel and Power in pursuance of the powers conferred on him by Section 7 of the Gas Regulation Act, 1920, as amended by the Gas Undertakings Act, 1934, prescribes that the rate of contribution to the Gas Fund for the year 1947 shall be: (*a*) eightpence for each 5,000 therms in the form of gas sold during 1946 (excluding gas sold to other undertakers in bulk for distribution and gas supplied separately for industrial purposes only); and (*b*) fourpence for each 5,000 therms in the form of gas supplied separately for industrial purposes only during 1946. The contribution is to be paid on or before April 1 to the Minister of Fuel and Power at Heyhouses Lane, Lytham St. Annes, by all gas undertakers with respect to whom an Order under the Gas Regulation Act, 1920, shall have been made or to whom subsection (3) of Section 7 of that Act applies by virtue of any public general Act, special Act or Special Order.

Diary

Jan. 23.—Industrial Gas Development Committee, Gas Industry House, 10 a.m.

Jan. 24.—Gas Companies' Protection Association: Committee, 2.30 p.m., 5, Victoria Street, London, S.W.1.

Jan. 25.—Western Junior Gas Association and Wales and Monmouthshire Junior Gas Association: Joint Meeting. Radiant House, Colston Street, Bristol. "Some Aspects of Space Heating," K. G. Eccleshare and F. J. Johnston (Bristol), 2.30 p.m.

Jan. 25.—Yorkshire Junior Gas Association: Discussion, Wakefield.

Jan. 28.—Southern Association of Gas Engineers and Managers (Eastern District): "The Principles of Purging Gas Plant and Holders," L. Silver. Gas Industry House, 2.30 p.m.

Jan. 28.—Midland Junior Gas Association: "Industrial Heat Treatment," L. D. Creedy, Birmingham.

Feb. 2.—Midland Junior Gas Association: Visit to the Keresley Colliery of the Coventry Colliery Company (first party).

Feb. 5.—Institute of Fuel (North Western Section). "Work of the North Western Regional Fuel Efficiency Committee," P. D. Kirkman, Engineers' Club, Manchester, 6.30 p.m.

Feb. 7.—London and Southern District Junior Gas Association: "Some Investigations on Leakage from Distribution Systems," C. D. Shann. Gas Industry House, 7 p.m.

Feb. 9.—Midland Junior Gas Association: Visit to the Keresley Colliery of the Coventry Colliery Company (second party).

Feb. 10.—London and Counties Coke Association: Technical Committee, 2.30 p.m. Gas Industry House.

Feb. 11.—Midland Junior Gas Association: "The Engineer and the Accountant in the Gas Industry," R. Thompson, Bilston.

Feb. 12.—Manchester and District Junior Gas Association: Visit to Works at Trafford Park. Paper, "Industrial Gas," T. H. Pardoe (Stretford).

Feb. 20.—Institute of Fuel (North Western Section). "Review of the Work of R/16 Committee," Dr. E. G. Ritchie. Radiant House, Bold Street, Liverpool, 2.30 p.m.

Personal

Mr. W. A. P. Hoskin, who has been with the Barnsley District Coking Company since its foundation in 1936, has recently been appointed Works General Manager.

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Miss E. H. Smith, whose New Year Honour (the award of the M.B.E.) was announced last week, was, before the war, Secretary (not Assistant) to the late Mr. C. Valon Bennett, Engineer and General Manager of the Rochester, Chatham, and Gillingham Gas Company.

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Mr. F. W. Johnson, Registrar of the Liverpool Gas Company, has been awarded the "James William Slack" Prize in the Final Examination of the Chartered Institute of Secretaries. The Prize is awarded to the Liverpool candidate attaining the highest number of marks in the examination.

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The Women's Gas Council accepts with regret the resignation of the Organizing Secretary, Mrs. G. Abbott, as from a date to be agreed. Mrs. Abbott finds that she is no longer able to give her whole time to the work of the Council, which has increased considerably during her five years in office. Further expansion is envisaged, since the Women's Gas Council has an increasingly important part to play in the development of the Gas Industry.

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Mr. Brian G. H. Clegg, B.A., formerly State Scholar and Scholar of Trinity College, Cambridge, has been appointed Statistician to the Liverpool Gas Company in succession to Mr. A. C. Wild. During the war Mr. Clegg was a scientific officer with the Ministry of Aircraft Production, holding an honorary commission as Flight-Lieutenant in the R.A.F.V.R. He served in the Middle East, North Africa, Italy, and Ceylon.

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At the meeting of the Grand Council of the Federation of British Industries Sir Frederick Bain, Deputy President, was nominated President of the Federation. This nomination, which was unanimously approved, will come before the annual general meeting of the Federation in April, when Sir Clive Baillieu will retire from the Presidency, having held office for two years. Sir Frederick Bain, a Deputy Chairman of Imperial Chemical Industries, Ltd., was from 1941-1944 Chairman of the Chemical Control Board, Ministry of Supply, and Chairman of the Chemical Planning Committee of the Ministry of Production.

Mr. A. J. Broad, of Bath, has been appointed Distribution Superintendent to the Nelson Gas Department.

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Sir Leslie Boyce, K.B.E., has been appointed Deputy Chairman of the Severn Valley Gas Corporation, Gas Consolidation, Ltd., and Palatine Development Company, Ltd.

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Acting on medical advice, Mr. A. E. Sylvester has resigned his position as Chairman of the British Gas Council, and has been elected President. Colonel H. C. Smith, Vice-Chairman of the Executive Committee, has been elected Chairman of the Central Board and of the Executive Committee in place of Mr. Sylvester. The changes were made at the meeting of the Central Board on Jan. 14, when appreciation was expressed of the outstanding services rendered by Mr. Sylvester to the British Gas Council since its inception in March, 1945.

* * *

Sir Ernest Simon, Governing Director of the Simon Engineering Group, which includes Henry Simon, Ltd., Simon-Carves, Ltd., and Turbine Gears, Ltd., was raised to the peerage in the New Year Honours list. His Barony was given "for public services," embracing 35 years' work in the fields of local government, housing, town planning, and university education, as well as heavy responsibilities in numerous Government appointments during and since the recent war. In 1901 he entered Henry Simon, Ltd., the flour milling engineering firm founded by his father in 1878, and in 1910 he became its Chairman at the early age of 30; he was shortly afterwards appointed Chairman of Simon-Carves, Ltd., the Stockport firm of coke oven, coal washery, chemical plant and power station contractors. His public career began in 1912 when he became a member of the Manchester City Council; after the first World War he was Chairman of the Manchester Housing Committee, and in 1921 he was elected Lord Mayor of Manchester. He was returned to Parliament as Liberal member for Withington in 1923 and again in 1929,

becoming Parliamentary Secretary to the Ministry of Health in 1931 under the late Neville Chamberlain ; in 1932 he became a member of the Economic Advisory Council, and in the New Year Honours of that year he received a knighthood for political and public services. During the war Sir Ernest was Chairman of the Area Board and Area Officer for the Ministry of Aircraft Production from 1940 to 1942, and Lord Reith then appointed him Deputy Chairman of the Central Council for Works and Buildings. After a visit to the United States at the request of the Ministry of Information, Sir Stafford Cripps asked him to become Chairman of Parnall Aircraft, Ltd. Sir Ernest was later appointed Chairman of the Advisory Council to the Ministry of Fuel and Power, in which capacity he was responsible for the Simon Report on domestic fuel policy. Besides undertaking an amount of public work that most men would regard as a full-time occupation, Sir Ernest has for a generation been the active head of the companies comprising the Simon Engineering Group and has also found time to write more than half a dozen books on the subjects to which his life has been devoted; the latest of these is "Rebuilding Britain: A Twenty Year Plan," which was published in 1945.

Obituary

The death occurred on Jan. 11, following an operation, of Mr. T. W. SAVILLE, a member of an old and respected Gas Industry family, who was Engineer and Manager of the Littlehampton Gas Company until shortly after its absorption by the Brighton, Hove, and Worthing Gas Company, when he retired. Before going to Littlehampton Mr. Saville was Engineer, Manager and Secretary of the Stone (Staffs) Gas Light and Coke Company.

* * *

We regret to record the sudden death on Jan. 14 of Mr. JOSEPH SADLER, of Cardiff, who for 25 years successfully discharged the duties of Social Secretary of the Wales and Monmouthshire Association of Gas Engineers and Managers. It was an office to which he was never formally appointed and one which never appeared in the official list, but Joe Sadler was devoted to the work, and the success, on the social side, of every meeting of the Association in the last quarter of a century was due in large measure to his genial personality and organizing ability. Last September his silver jubilee was marked by a presentation at the Porthcawl meeting, at which he recalled that he had served under 21 Presidents, two Secretaries, and one Assistant Secretary. Whatever he had done, he said, had been a labour of love and he was grateful to the two firms he had represented for giving him every encouragement and facility. Mr. Sadler spent the first ten years of his career with the Newport (Mon.) Gas Company, after which he joined the staff of John Wright and Co., Ltd. About 17 years ago he became Representative of the Parkinson Stove Co., Ltd., for South Wales, and five or six years ago he also took over the representation of C. R. Averill, Ltd., in Wales and the six south western counties. He retired from the former post in 1945, when he was succeeded by his son, Mr. Arthur Sadler, but retained the latter up to the time of his death. Mr. E. M. Edwards, President of the Wales and Monmouthshire Association, and a large number of friends in the Gas Industry, attended the funeral at Newport.

Letter to the Editor

The Gas Engineers' National Guild

DEAR SIR,—Many gas engineers are considering the advisability or otherwise of supporting the Guild. In this connexion may I take the liberty of suggesting that it is incumbent upon us all to ponder carefully Sub-section (1) of Section 47 of the Electricity Bill, bearing in mind that the important words are "machinery" in the second line in the paragraph and "organization" in the fifth line. There is a very interesting editorial bearing on this subject in the January issue of *Coke and Gas*, which I think, with advantage, might be studied.

May I also be bold enough to suggest to members of the Guild that the important thing at the moment is the "organization" rather than its premature use in endeavouring to improve existing salaries, however low they may be considered to be.

Yours faithfully,

F. C. BRIGGS,
Engineer and Managing Director.

Dudley, Brierley Hill and District Gas Company,
Dudley.
Jan. 17, 1947.

Glasgow Exhibition

The travelling "Home Planning" Exhibition of the British Gas Council was opened at Glasgow on Jan. 14 by Lord Provost Sir Hector McNeill.

Speaking at the opening, Bailie Neitch, Convenor of the Gas Department, said there had been a 7% increase in the use of gas over last year. During December there were four occasions on which the use of gas was far above normal consumption. Dec. 31 reached the highest peak at 45.6 million cu.ft. The exhibition, said Mr. Neitch, had been shown at Paisley and Dundee and this display at Glasgow was the final showing of the exhibition before it went back to England.

The Lord Provost referred to the difference between the big black cooker of the old days and the modern enamelled type of the present time. Among the range of cookers on view were some which were made to the Glasgow Gas Department's own specifications.

Mr. David Fulton, Chairman of the Scottish Area of the British Gas Council, expressed the appreciation of the British Gas Council to the City of Glasgow.

Among those present at the opening were Colonel Norman McLeod, Dean of Guild, Mr. D. D. Burns, Secretary and General Manager of the Glasgow Gas Department, and Mr. W. H. Beckett, of the British Gas Council, who has been directing the exhibition throughout its tour.

Redundancy Application

An application was made by the Alliance and Dublin Gas Consumers Company at a Labour Court presided over by Mr. R. J. P. Mortished in Dublin on Jan. 10 to have a number of workers in the retort houses declared redundant. The application was opposed by the employees' union.

Mr. N. J. Robertson, General Manager, said that the application affected a number of men employed on No. 1 and No. 2 benches of vertical retorts. From the end of 1941, coal of an inferior quality had to be accepted and it was of high moisture content. It refused to run freely down the bunker slides and additional labour had to be employed to free it. The increase was three men per shift on No. 1 and No. 2 and one man per shift on No. 3. Representations were made to the British Minister of Fuel and Power in 1943, who agreed to improve the quality of coal. The cost of carrying nine redundant men was £3,500 per annum, increasing to £4,000 under a new wages demand, and which was being borne by gas consumers.

Mr. Sean O'Moore, Irish Seamen's and Port Workers' Union, said that the men on the work in question were satisfied that 16 retorts per man was quite enough, irrespective of whether the quality of the fuel improved or not.

The Chairman said that he wondered if it would be possible for the parties to reach an agreement.

The decision will be given later.

Lanarkshire Developments

In a report which has been approved by the Gas Committee, Mr. Fred R. Mitchell, Engineer and Manager of the Lanarkshire County Gas Department, estimates that production may show an increase of approximately 100% by about 1950. Demand for gas throughout the districts has been steadily increasing during recent years. With developments now proceeding, and those which can be anticipated, gas loads will be comparatively high, and question of additional production plant to meet these loads should receive attention.

Regarding supply of gas for industrial purposes, the position in Lanarkshire is undergoing a substantial change. Existing and new industries are showing an increasing interest in gaseous fuel for their various processes, and in certain cases it has been indicated that alternative fuels are not suitable or desired. Domestic consumers are also using gas to a greater extent and when appliances are again available in quantity, the domestic load will probably show a substantial increase.

"I have estimated the probable gas requirements over the next four to five years," said Mr. Mitchell, "and, while the estimated figure in regard to gas for industry must, in the absence of precise information, be on very broad lines, I anticipate that gas production could easily show an increase of about 100% by 1950. Such increase would, of course, be rather unusual in Gas Industry practice over that period, but is accounted for to a large extent by the changing industrial conditions in Lanarkshire."

Hartlepool Corporation has agreed to a proposal by the Hartlepool Gas and Water Company to increase gas street lighting charges by 40%. The Company originally intended raising the rates by 50%, but the Corporation refused to pay that amount.

News in Brief

Tokio Gas Company recently announced that consumers will be charged a penalty rate ten times the normal cost for all gas used in excess of the daily ration of 40 cu.ft.

Darlington Town Council intends to apply to the Government for an extension of its area of gas supply to include the whole of the planned satellite town near Aycliffe. At present most of the new town is already within the area of supply.

Middlesbrough Corporation has pointed out to the Board of Trade that unless there is some improvement in the supply of wrought iron and steel pipes for the Gas Department, houses would be erected without gas supplies.

Tipton Gas Department has decided to increase the price of gas to domestic consumers by 13%. The price will still be less than in some of the neighbouring towns. It is the first increase for many years, in spite of the fact that coal has gone up 100% and wages have jumped considerably.

Replying to an Application for permission to erect an additional gasholder at Bo'ness Gas-works, the Ministry of Fuel and Power has suggested that the proposal be deferred for about a year, when the matter can be reviewed in the light of the ferrous metal supply then prevailing. The Gas Company is to press the Ministry to sanction the application.

The Midland Region of the British Gas Staff Association held its first meeting at the Grand Hotel, Birmingham, when the Regional Council was elected and the following appointments made: Chairman, W. Wilson (Leamington); Vice-chairman, E. L. Jones (Redditch) Treasurer, R. E. Booth (Willenhall); Secretary, G. Dixon (Wolverhampton).

The Suggestion of the Bourne (Lincs.) Gas Committee that a new gasholder should be installed at the gas-works has been rejected by the Ministry of Fuel and Power. The existing plant, which has been the subject of local criticism for some time, will soon have to supply the houses which are being erected under the Council's housing scheme, in addition to its normal load.

Outlining the Programme of Whessoe, Ltd., for 1947, in the "JOURNAL" last week we referred to the erection of a complete cooling and purification unit for horizontal gas for the South Metropolitan Gas Company at the Rotherhithe station. The capacity of the unit should have been given as 9.6 million cu.ft. per day, the accidental omission of the decimal point having made it appear as 96 million cu.ft.

A Street Lighting Agreement has been reached between Berwick Corporation and the Berwick Gaslight Company following an offer to discontinue the charge of 1s. a week for the hire of lanterns. The agreement provides for a graduated charge of 6s. 2d. per 1,000 cu.ft. for the first 125,000 cu.ft., falling to 5s. per 1,000 cu.ft. for all gas used over 725,000 cu.ft. Berwick has 471 street lamps and all these will be lit when mantles, &c., are more readily available.

In a New Year Message in the January issue of the Gas Light and Coke Company's Co-partners' Magazine, Mr. A. E. Sylvester, referring to his retirement, says: "I take comfort in the thought that your new Governor, Mr. Michael Milne-Watson, is a young and able man worthy of holding this high office. I have closely watched his career in the Company and he has throughout worked intimately with me; there is no one to whom I would rather have handed on the job."

To Assist Housewives in the better planning of the home and the kindred tasks of the house for which they are responsible, the Coventry Gas Department inaugurated on Jan. 16 a series of ten weekly homecraft courses. The lectures, which are given on Thursday afternoons, take a variety of forms and include talks on food, handy jobs about the home, home laundry, architecture as applied to houses of our time, kitchen planning, make-do-and-mend, local health services, and choice of consumer goods.

Limerick Corporation is entering into negotiations with Limerick Harbour Commissioners for the acquisition, if terms can be arranged, of some three and a half acres of land as a site for the proposed £400,000 new gas-works. The old plant is well worn out and can be kept in commission only by constant attention and costly repairs. The proposed site is at Corkanree. At the last meeting of the Harbour Board a letter was read from Mr. J. J Dundon, Law Agent to the Corporation, applying to purchase the site. The Harbour Engineer pointed out that the Corporation wanted to purchase outright, whereas the Board was only leasing in view of possible developments. He agreed that gas-works were much needed. The application was referred to the Port Development Committee.

Billingham-on-Tees Urban Council has approved plans by Stockton Gas Department for an 8 in. diameter high pressure gas main and a 12 in. low pressure main from Stockton Gas-works to the Haverton Hill Gas-works.

The Intelligence Section of the Gas Research Board, which has hitherto been housed in Room 12, City and Guilds College, Exhibition Road, S.W.7, has removed to 144, Cromwell Road, Kensington, London, S.W.7 (Telephone: Western 6448).

Leicester Gas Committee has recommended the payment of a monetary grant together with a royalty on all sales to the Corporation Gas Industrial Equipment Officer, who, in collaboration with the manufacturers of bakery equipment, has developed a new design for a gas-fired bakery oven.

United Kingdom Output of pig iron in 1946 was 7,761,000 tons compared with 7,107,000 tons in 1945; output of steel ingots and castings was 12,693,000 tons in 1946 and 11,824,000 tons in 1945. The average weekly rate of pig iron production in December was 153,200 tons compared with 153,900 tons in November, and of steel ingots and castings, 236,300 tons, compared with 263,800 tons.

An Obvious Error occurred in the particulars of the Society of British Gas Industries in page 157 of the 1947 issue of the "JOURNAL" CALENDAR AND DIRECTORY. The name of Mr. D. Rider, O.B.E., Vice-Chairman, which should have been substituted for that of Mr. A. Watson (now Chairman) was incorrectly inserted in place of the name of Mr. M. W. Burt, Manager and Secretary. We regret this unfortunate slip and welcome the opportunity of emphasizing that Mr. Burt is not leaving the Industry.

A British Standard Specification for test code for gas-fired waste-heat (with or without auxiliary firing) and water gas plant boilers (B.S. No. 1307) has just been published. This code covers the testing of gas-fired boilers and waste-heat boilers (with or without auxiliary firing). Special consideration has been given to waste-heat boilers operating on the exhaust of internal combustion engines. It is hoped that through the use of this code it will be possible to avoid difficulties and misunderstandings which have hitherto arisen in the correlation and comparison of results obtained in different tests, due to the lack of standard testing procedure and technique. Copies may be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, London, S.W.1, price 5s.

Bombay Gas Company

The Directors of the Bombay Gas Company have received from the Asiatic Textile Company—who offered to purchase the whole of the £300,000 stock at 50s. per £1 unit—a notification that acceptances of the offer already exceed the minimum required, namely 90% by Jan. 23.

It is assumed, therefore, that the deal will go through. In accordance with the agreement of Nov. 28 payment will be made on about Feb. 5 to stockholders accepting.

Radiant House on Wheels

Edinburgh is the first city in Great Britain to try out a novel experiment in new housing areas which, it is hoped, will prove of interest and value to young wives and mothers. On Jan. 14 the Lady Provost, Miss Diana Falconer, officially opened at Muirhouse, in the Granton district of the city, a homecraft centre on wheels which has been called "Radiant House." Capable of seating 50 persons, this demonstration showroom, in which are fitted all the "wonder" gadgets of the temporary house, is to remain in the district for the next month.

The idea behind "Radiant House" is to help the dwellers in the surrounding pre-fabs to obtain the maximum satisfaction from their gas cooker, refrigerator, and coke fire. Lectures have been planned on cooking, make-do-and-mend, gardening, health, sick nursing, and community living. Immediately after the opening ceremony, the first cookery demonstration was given by a Ministry of Food demonstrator.

"Radiant House" has been sponsored by the Corporation Gas Department, R. & A. Main, Ltd., the Ministry of Food, and the Muirhouse Community Association. There are over 200 members of the latter body, and arrangements are being made for meetings, educational film shows, and social gatherings on Tuesday and Friday evenings. A site has already been allocated in the district, but the residents of Muirhouse are still awaiting delivery of a permanent community hall of their own from the Corporation. "Radiant House" should therefore prove useful as a temporary home for the Association.

After its stay at Muirhouse, the "House" will be taken to other new housing areas in Edinburgh.

Junior Associations' Activities

FOR the benefit of non-Junior readers of the "JOURNAL" we summarize below the more important features of the January issue of "GAS," our monthly record of the British Junior Gas Associations, and give a pre-view of the contents of the February number, to be published next week.

Education and Training

Concluding a survey of education and training schemes for the rehabilitation of ex-servicemen the January issue gave an account, with a series of illustrations by our staff photographer, of the post-war training carried on at Watson House, accepted hub of training activities in the Gas Industry. Even when all the men now serving have returned and have received their reinstatement course, the Gas Light and Coke Company's task will not be completed, for all the employees retained by the Company during the war and who, by pressure of work, were prevented from attending instructional courses other than evening classes, must themselves receive refresher courses to bring their knowledge up to date and enable them to better their position.

Oxide Purification

In his Paper on "The Operation and Control of Oxide Purification" presented to the Yorkshire Junior Gas Association and published in the January issue, Norman B. Biggs (Halifax) showed that although of all the chemical processes used in industry that of oxide purification is one of those needing least attention, it is in fact highly complicated and has considerable bearing on the economics of gas manufacture. He covered a wide field, from a study of the characteristics of the materials to be used—both new and spent oxide—through mechanical maintenance, emptying and filling operations, and conditions necessary for efficient working, to routine testing, records, and fault detection. In the February issue there will appear a report of the discussion, in which Mr. Biggs considerably enhanced the value of his Paper by answering questions on such varied matters as oxide expansion, gum formation, the effect of back pressure on the working life of purifier boxes, and the use of lime for restoring the alkalinity of oxide.

Pointer to the Future

In the opinion of H. N. Dann (Blackburn), who read a Paper entitled "1938-1944: A Pointer to the Future" to the Manchester and District Junior Gas Association (appearing in the February issue), future development lies in the direction of a study of the market possibilities in the domestic sphere, the intensification of effort in the direction of commercial applications, and large scale projects in the industrial field. The essential feature underlying all these modes of application is the development of a maintenance service raised to the highest pitch of efficiency. Looking forward to the time when the coal position may be easier, the Author foresees a falling off in the present phenomenal increases in gas outputs, but he holds that the Industry can and should exert itself to hold and increase the load in its entirety, although certain types of demand may by their very nature become redundant. Conversions from solid to gaseous fuel have been and are very extensive, the relative costs being helpful to the adoption of gas service and the freedom from the restraints of rationing a powerful stimulus.

Foundations and Reinforced Concrete

Foundation and reinforced concrete work presents problems on every gas-works, but on none so much as those where heavy structures have to be erected on reclaimed mudlands, and even on the sea bed. There is therefore much that is unique in the Paper on "Foundations and Reinforced Concrete Work on a Gas-works" which F. Ward, Chief Draughtsman of the Bournemouth Gas and Water Company, gave to the London and Southern District Junior Gas Association. The first half of the Paper appeared in the January issue of "GAS"; the remainder, with the discussion, will be included in the coming issue. It is an account of difficulties successfully overcome, and the Author's description of the construction of a gasholder tank and foundations for vertical retorts is of considerable interest. The discussion is no less valuable than the Paper itself, notably on account of the contribution by Mr. W. H. White, Clerk of Works of the Gas Light and Coke Company, who constructively criticizes many of the points in the Paper and adds helpful information as to his Company's experiences.

Radiant Heating in Industry

The January issue of "GAS" contains a full report of a Paper on "Recent Developments in Radiant Heating for Industrial Processes" which R. F. Hayman, of Watson House, gave to the London and Southern District Junior Gas Association. One of the most important things that has been learned about the subject is what radiant heating will not or can not do. This knowledge has been gained by practical experience as a result of demands from all manner of consumers to speed up output of a wide variety of operations. The Paper sets out a lengthy list of successful applications, classified under the headings of (*a*) paint curing and metal finishing, and (*b*) processes other than metal finishing, and quite frankly adds a shorter list of processes other than metal finishing in which experiments have been proved to be unsuccessful. The discussion includes a contribution by J. B. Carne describing work done in similar directions by the South Metropolitan Gas Company, and the views of representatives of several firms engaged in the manufacture of radiant heating equipment.

Water Treatment

Gas-works use quite a lot of water, and its treatment and preparation for boiler feed and other purposes is a matter of considerable importance. H. G. Stapley, of the Exeter Gaslight and Coke Company, in a Paper on "Corrosive Water, its Treatment and Preparation for Boiler Feed and Other Purposes," presented to the Western Junior Gas Association, which will be published in the February issue, shows that his Company uses something of the order of 348,000 gal. of water per day. The whole of this water is taken from a canal near the works, a canal which is the oldest navigable ship canal in the country and connects Exeter with the sea at Exmouth and is fed by the River Exe. The water from the canal has peculiar characteristics and is very corrosive. The original treatment plant consisted of one vertical pressure filter through which was pumped the whole of the water used on the works. In 1944 a comprehensive survey of the whole system was carried out, as a result of which a complete new water treatment plant, including filters, base exchange, chemical dosage, and electrical de-oiling plant, was designed and erected by Filtrators, Ltd., of London. Although the plant has not been in commission for very long, the results to date are very satisfactory. Excluding wages and capital interest the cost of chemical treatment only is 3½d. per 1,000 gal. One man is engaged full time in attending to the plant and preparing solutions.

Modern Developments in Carbonization

One of the highlights of the February issue of "GAS" will be the Paper on "Modern Developments in Coal Carbonization" presented by C. A. Poulson, of West's Gas Improvement Co., Ltd., to the Scottish Junior Gas Association, a summary of which was published in the "JOURNAL" of Jan. 1 (page 29). It outlines recent advances in plant for the carbonization of coal which may be acclaimed as a prelude to a new era in the process of gas manufacture, and in the Author's opinion the items described will be the forerunner of fully automatic plant operation and control. We are now passing, he says, from the age when arduous manual labour is required in the retort house to a modern process of operation by mechanical means. The retort house attendants of the future will be reduced in number, but the degree of skill required of them will be of a higher standard. Perhaps no other business has taken science into its service more thoroughly than the Gas Industry, and during the war years the science of gas and its numerous by-products has advanced tremendously as the result of intense research. The carbonizing plant of the future will be an extremely flexible unit, the output from which will be varied by the technical operator through press-button control. The Author also foresees in the next few years the development of automatic calorific value control. Referring to the external appearance of gas-works the Author remarks that in these days of town and country planning the architectural appearance of any sizeable industrial building is required to harmonize with that of the surrounding dwellings and estates. For some years plant designers have given architectural design increasingly more consideration so that pleasing and modern lines are effected. The result has been to produce retort house buildings which are attractive to the eye, fitting in to the local amenities. Many are of stately design which do justice to the Industry. The additional cost of such buildings is admittedly somewhat higher than those stern and stereotyped designs of yesterday but such extra expense is amply justified. Often other features of the plant can be embodied in the modern layout. It provides a basis on which other works buildings can be planned, and there is always an incentive to keep good-looking plant in a good state of maintenance and cleanliness. It is coming to be realized that a gas-works need not be so dirty as sometimes imagined. A gas-works properly designed and well maintained need not be at all unsightly. The layout of the future will be ornamented with lawns and trees to fit in with the fashion of its surroundings.

Miscellaneous

January "GAS" describes visits paid by the London and Southern District Junior Gas Association to Maidstone; the Midland Junior Gas Association to the works of Wrights' Ropes, Ltd.; and the Yorkshire Junior Gas Association to Sheffield. In the February issue will be found reports of the Manchester and District Junior Gas Association's visit to Blackburn and of the Yorkshire Junior Gas Association to the works of Parkinson and Cowan (Gas Meters), Ltd.

Wartime Consumption of Sulphate of Ammonia

British Federation's Annual Report

WARTIME restrictions on publication of statistics having been removed an attempt is made in the 26th annual report of the British Sulphate of Ammonia Federation, covering the year to June 30, 1946, to restore the main features of the pre-war reports. Complete statistics for world production and consumption of fertilizer nitrogen are not yet available. The figures for 1945-46 in the following summary are estimates based on the published information at present available:

WORLD PRODUCTION (EXCLUDING U.S.S.R.) OF FERTILIZER NITROGEN

Year	Production metric tons	Consumption metric tons
1937-38	2,382,000	2,397,000
1938-39	2,542,500	2,456,000
1945-46	1,878,000	1,880,000

Corresponding figures for the United Kingdom alone are:

Year	Production metric tons	Consumption metric tons
1937-38	135,000	68,000
1938-39	128,000	68,500
1945-46	248,000	166,000

The total world demand for fertilizer nitrogen for 1945-46 was greatly in excess of the supply available. War damage to nitrogen plants and inadequate fuel supplies were responsible for the shortage. Supplies of nitrogen, phosphate, and potash were apportioned between consuming countries and sources of supply designated by the International Emergency Food Committee set up by the Governments of United Nation Countries in Washington.

Home Production

The figures in the following table showing the total production of ammonia products expressed as sulphate, are calculated on the basis of 25% ammonia (about 20.6% nitrogen). The figures for sulphate of ammonia production, however, apply to actual tons of product with a nitrogen content varying from an average of about 20% in the earlier years to about 21% from 1933 onwards.

PRODUCTION OF AMMONIA AND OF AMMONIUM SULPHATE IN THE BRITISH ISLES

(Tons of 2,240 lb.)

Calendar year	Ammonia products expressed as sulphate of ammonia equivalent basis 25% ammonia	Included in the total: Industrial ammonia products (basis 25% ammonia) about	Sulphate of ammonia as such (actual tons of product) about
1913	423,966	66,000	365,000
1918	423,900	173,000	258,000
1923	441,216	45,500	391,500
1928	644,836	62,500	564,900
1933	692,955	88,500	580,700
1938	718,100	132,300	503,200
1939	772,500	182,700	483,300
1940	932,500	156,700	498,500
1941	1,135,000	176,900	590,400
1942	1,286,000	227,900	620,400
1943	1,541,000	181,500	826,500
1944	1,453,500	178,800	779,500
1945	1,410,000	194,700	760,400

The figures for total production of ammonia products in Great Britain for 1913-39 are based on the Alkali Inspector's Reports. Subsequent figures are estimated.

The following figures show the development of agricultural consumption during the second German War in the British Isles and Channel Islands:

Fertilizer year	Tons of 2,240 lb. Sulphate of ammonia for sale	Agricultural consumption	Consumption in metric tons nitrogen Sulphate of ammonia 20.6 N	Nitrogen in other forms	Total nitrogen
1937-38	534,000	224,500	46,987	21,196	68,183
1938-39	490,000	215,537	45,111	23,537	68,648
1939-40	500,000	282,475	59,121	27,444	86,565
1940-41	534,000	473,854	99,176	33,707	132,883
1941-42	611,000	636,506	133,218	35,061	168,279
1942-43	710,000	639,010	133,742	38,423	172,165
1943-44	840,000	665,280	139,240	43,692	182,932
1944-45	733,000	615,110	128,740	45,325	174,065
1945-46 approx.)	803,000	553,200	115,800	50,200	166,000

Sulphate of Ammonia and Food Production

The part played by sulphate of ammonia during the war years in providing that extra food required from the soils of Britain, without which this country could not have been fed, is well illustrated by the foregoing figures showing consumption since 1938-39.

The increases in sulphate of ammonia consumption were due not only to the large increase in the area of land under the plough, but also to greater efficiency in the technique of crop production wherein fertilizers played a very important part. Consumption of nitrogen in the United Kingdom was trebled between 1939 and 1943, rising from approximately 60,000 tons in 1938-39 to 180,000 tons in 1943-44, whereas the increase in the area of land under crop during the same period was very much less, the total area of land under crop in 1939 being 8.8 million acres and in 1944 14.6 million acres. Corresponding figures for cereals are 5.2 million acres in 1939 and 8.9 million in 1944.

In the early days of the war, official attention was mainly directed towards increasing as rapidly as possible the area of land under crop. It was realized from the beginning, however, that yield per acre, as well as the number of acres under the plough, would play a vital part in maintaining food supplies and as the correct use of fertilizers was known to be one of the most important factors affecting yield per acre, the question of fertilizer supplies and fertilizer practice received more and more attention as the acreages of crops increased.

Drs. E. M. Crowther and F. Yates, of Rothamsted, published an important statement in 1940, entitled " Fertilizer Policy in Wartime," which sets out clearly the advantages which would result from a much more enlightened use of fertilizers than was practised before the war. This Paper was largely used as a basis for official policy in respect of fertilizers.

Survey of Fertilizer Practice

Much effort was made, both by official and commercial organizations, to bring about a widespread improvement in fertilizer usage with considerable success. One of the novel features introduced into this fertilizer drive was the Survey of Fertilizer Practice carried out by the official Advisory Chemists. From the results of this survey it was estimated that before the war two-thirds of the cereal crops throughout the country received no nitrogen fertilizer, whereas by 1942 about 60% of the greatly increased acreage received the equivalent of 1¼ cwt. sulphate of ammonia per acre. In Northern Ireland as early as 1943 it was decided that a greater increase in food production could be obtained by an all-out fertilizer drive with a view to ensuring a general improvement in fertilizer usage, than by increasing further the acreage of land under the plough. As a result the consumption of sulphate of ammonia rose to nearly 40,000 tons in 1944, compared with the 9,000 tons used in 1939. During the same period the area of land under crop increased by less than 85%.

A further interesting feature of the wartime fertilizer story is the increase in the ratio of nitrogen to other plant foods consumed as fertilizers. The ratio of nitrogen to phosphate increased from 1: 2.9 in 1938-39 to 1: 1.9 in 1943-44. During this period the nitrogen content of compounds was raised from an average of about 3.5% to 5.25%.

The agricultural organization of Imperial Chemical Industries, Ltd., played a very important part in the food production drive. It was decided that the full weight of this organization should be utilized to assist in increasing crop production by raising the consumption of nitrogen in all ways consistent with good husbandry.

Throughout the war the closest possible co-operation was maintained with the Ministry of Agriculture and the County War Agricultural Executive Committees. Some of the members of the I.C.I. Agricultural staff were seconded to the County Committees as full-time Executive and District Officers. Most of the remainder at a later stage were invited to serve on the Technical Development Committees which were formed in each county.

An early review of the agricultural position of the nation indicated the certainty of a grave restriction in the imports of feeding stuffs with the consequent need for a policy of self-sufficiency on the farm.

On this aspect, I.C.I. was particularly fitted to assist farmers as a result of the investigation and development work which had been done before the war on the conservation of grass. In addition, Jealott's Hill was amongst the foremost research stations in the country on questions of animal nutrition.

Silage Making

A decision was taken to concentrate on a campaign to convert farmers to the practice of silage making. The organization of this scheme was rapid and efficient, and at a later stage was taken over as part of the Ministry's own general production campaign. In the first instance, several hundred voluntary and part-time workers were organized and given a short training course in the principles and practice of silage making and in the feeding of silage, representatives of the British Sulphate of Ammonia Federation acting mainly as senior instructors and organizers. Hundreds of demonstrations were carried out, and in 1941 it was estimated that over a million tons of silage was being produced. This campaign alone enabled the efficient utilization many thousands of tons of sulphate of ammonia on grassland.

The increase in the top-dressing of cereals with nitrogen is further evidence that pre-war propaganda and demonstration has borne fruit. The research and development work done by Jealott's Hill demonstrating the value of this practice had been accepted by most of the cereal growers in pre-war days, but economic conditions before the war had militated against widespread practice. The wartime patriotic urge and a more satisfactory economic condition having been established by stable prices on a satisfactory level for wheat, barley, and oats encouraged those who had previously refrained from top-dressing to adopt the practice without further hesitation.

In some of the wetter districts, where the danger of lodging has always been the inhibiting factor, the Ministry of Agriculture issued directions to farmers to use 1 cwt. sulphate of ammonia per acre on cereals. This direction unfortunately coincided with one of the wettest seasons for many years which laid corn over a wide area of the North and West and created very difficult conditions for the harvest. The farmers' reaction in these areas has been unfortunate as sulphate of ammonia has borne the whole of the blame.

Official statements on post-war agricultural policy suggest that there is likely to be a gradual switch from the production of crops for direct human consumption to the production of livestock and livestock products. This will mean a reduction in consumption of nitrogen unless the utilization of nitrogen on crops for stock consumption, including grass, can be increased. Before such development can take place, however, much investigational and demonstrational work is required to be done and a scheme for this purpose was prepared last year and is being put into operation.

Exports

Details of the total shipments of sulphate of ammonia from the United Kingdom for the last 17 fertilizer years are set out in the report. From the outbreak of war overseas shipments could be made only under export licences issued by the Board of Trade. In view of the growing requirements of the home market, shipments were for a time suspended entirely except for special Government purposes. As a result, total exports, which reached 321,868 tons in 1938-39, declined to 237,727 tons in 1939-40, 22,939 tons in 1940-41, and to 18,627 tons in 1941-42. In 1942-43, however, they rose to 30,202 tons, and in 1943-44 to 60,684 tons. By March, 1944, production which was reinforced by the operation of the Ministry of Supply factory at Prudhoe exceeded home market requirements and exports on a substantial scale were resumed. For 1944-45 the total exports were 206,450 tons, while the estimated figure for 1945-46 is given as 274,589 tons.

Home Prices

In recent years the following ranges of prices per ton were charged to British farmers, delivered in 6 ton lots to buyer's nearest station, for neutral quality, 20.6% N minimum:

Sulphate of ammonia	1930-31	1932-33	1933-34	1939-40	1940-41 to 1945-46
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
July	10 2 0	5 5 0	6 10 0	7 5 0	9 10 0
August	8 17 0	5 5 0	6 10 0	7 3 6	9 11 6
September	8 19 0	5 5 0	6 15 0	7 5 0	9 13 0
October	9 1 0	5 5 0	6 15 0	7 6 6	9 14 6
November	9 3 0	6 0 0	6 17 6	7 8 0	9 16 0
December	9 5 0	6 2 6	7 0 0	7 17 6	9 17 6
January	9 8 0	6 5 0	7 2 6	9 0 0	9 19 0
February	9 10 0	6 7 6	7 5 0	9 3 0	10 0 6
March-May	9 10 0	6 10 0	7 5 0	9 6 0	10 2 0
June	9 10 0	6 10 0	7 5 0	9 6 0	10 2 0

At the outbreak of the war it was agreed with the Ministry of Supply that home prices would be increased to meet increased costs of production and distribution due to the war. Subsequently the Ministry of Supply decided to "peg" prices at the 1940-41 level and to grant producers a subsidy on home agricultural sales to cover increases in costs not included in the price.

Propaganda Work

Since the early establishment of a propaganda organization by the Sulphate of Ammonia Committee, it has steadily expanded in size, scope and effectiveness. The prerequisites of good propaganda are knowledge and truth, and these have been kept clearly in view throughout the years of propaganda for sulphate of ammonia.

In its early days, propaganda was devoted to sulphate of ammonia as a product with a strong emphasis on its value and use as a single fertilizer for a number of specific purposes. This sometimes resulted in sulphate of ammonia being used in the wrong conditions and out of balance with crop requirements. A certain amount of unfortunate and generally unjustifiable prejudice was thus created against the product.

The establishment of the Jealott's Hill Research Station by I.C.I. to provide more knowledge on the value and use of nitrogen and the rapidly increasing world accumulation of information on the interrelations between nitrogen phosphate and potash in the soil has changed the direction of Federation propaganda towards the balanced use of fertilizers with the nitrogen content of compounds adjusted to crop requirements.

Over the years, however, some of the specific uses of sulphate of ammonia as a single fertilizer have been clearly established, *e.g.*, the top dressing of cereals, and the practical results of this knowledge are reflected in the figures set out in the report.

The media for nitrogen propaganda have not changed much during the last 20 years. The spoken and written word have to some extent been supplemented by the use of radio and films during the war period. There has been close co-operation and co-ordination with the Ministry of Agriculture. The interest of the farmer and the agricultural merchant has been stimulated by press advertisements and press articles of a technical, practical, and instructive nature. During the war the issue of instructional and technical literature, which had a prominent place in previous propaganda, was restricted by paper shortage and a greater use was made of the farming Press. As paper restrictions are relaxed, the use of technical literature and instructional leaflets will be expanded.

Lectures, often illustrated by instructional films, are regularly given by the technical agricultural staff in the field, which now numbers 45 men. Field demonstrations of sound agricultural practice, including the use of nitrogen, play an important part in our propaganda activity.

In order to bring technical knowledge on the value of nitrogen within the reach of approximately 400,000 farmers, special efforts have been made to render this information available to the large body of agricultural merchants and their representatives in daily contact with farmers throughout the country.

In past years nitrogen has been used mainly on tillage crops. In future grassland will play an increasingly important part in the national economy. Accordingly an organization has now been set up to carry out a long-term investigation into grass land problems.

Eire Gas Workers' Wages

A Labour Court which sat at Cork on Jan. 13 to investigate claims for increased wages and improved conditions for employees of the Cork Gas Consumers' Company reserved its recommendations.

The principal claims were for 20s. a week increase in wages, inclusive of bonus; 2s. 6d. extra daily for shift workers; 2s. daily extra for those on the tar and sulphate plants; an additional 2s. nightly for night shift workers; 3s. an hour, the current city rate, for sheet-metal workers and meter repairers; 10s. a week extra for lorry drivers; and a 44-hour instead of 47-hour week.

It was stated that the scale of wages for boys was being left over for consideration between the Company and the Union.

In support of the men's case, reference was made to the wear and tear of clothing. Working shirts, which before the war cost 6s. 11d., were now 18s. 6d., it was stated. Boots, which used to last for several months, would not now stand repairing.

The workers' representative added that the men were directly affected by the official cost of living figures, but that the index figure did not actually fit the cost of living. Prices of beer, furniture, clothing, and tobacco in 1914 were negligible, yet it was contrived to relate the cost of living to 1914. In any event, that was assuming that all was well with the workers in 1914. The workers estimated that the total increases, if granted, would amount to £12,000 a year. This would mean less than 2¼d. weekly per user for meter users.

The Company's case was that though wages should be advanced somewhat to meet the cost of living, extras ought not to be paid for normal duties. There was no case for a reduction in hours of work, which would automatically be followed by reduced output and increased costs. The demands would bring total increases over pre-war level to £40,800, or an increase of 41% on the pre-war cost of gas to consumers, two thirds of whom were on slot meters, which was an indication that they could ill afford increased charges.

Mr. N. J. Robertson, General Manager of the Alliance and Dublin Gas Consumers' Company, who said that his Company was the largest in Eire, requested the Court to defer its decision until the hearing of the case of the Dublin gas workers, but the Chairman replied that the Court would have to deal with the application as made, and the Dublin application might not be reached for two or three weeks.

Dewrance & Co., Ltd., makers of boiler mountings and valves, have recently opened branch offices at 148, Great Charles Street, Birmingham, 3, under the management of Mr. R. W. Ogden, and at Mynshulls House, 14, Cateaton Street, Manchester, 3, under the management of Mr. W. A. Duckworth.

The Council of Industrial Design has received enquiries from exhibitors at the "Britain Can Make It" Exhibition who have been invited to take part in a Continental Fair. The Council, however, announces that it has not agreed to sponsor, support, or take part in any exhibition overseas purporting to reproduce, either wholly or in part, the "Britain Can Make It" Exhibition.

Testing of Solid Fuel Domestic Appliances*

By E. A. C. CHAMBERLAIN, Ph.D., D.I.C., B.Sc.
(Director of Research, Federated Foundries, Ltd.)
and J. A. TOOLE

(A "GAS JOURNAL" Abstract)

THE Authors discuss the testing of domestic solid fuel appliances in relation to the official control of their purchase for subsidized housing, the correlation of laboratory tests with practical results, and the effect of approval tests on development and design. They suggest that the over-elaboration of bench testing as a short cut to practical experience is fallacious and that some form of statistical evidence from actual users is the best guide to selection.

In their introduction the Authors suggest that the main contributory cause of the unsatisfactory nature of pre-war solid fuel domestic appliances was the fact that the user rarely had any choice in the matter. The actual buyer "was only concerned with the necessity of supplying something to fill up a hole," and this he did at the lowest possible cost to himself. The choice of the householders was usually restricted to the design and style of the "surround." The problem is now urgent for three reasons, the necessity for fuel economy, the restricted ration of solid fuel, and the high price of it. But these factors are superimposed on the main concern of the householder, which is with "amenity values" cleanliness in operation and maintenance, facility and flexibility in use, appearance. The Simon Report is quoted as sufficient support for the Authors' opinion that "solid fuel equipment, even at the present high cost of fuel, is cheaper to operate than gas or electrical equipment for the same service." The manufacturer must provide the user with appliances with the best amenity value and at the same time ensure that they operate with the highest possible thermal efficiency. "When, therefore, a system of Government control of appliances becomes firmly established, and the approval of their use in a controlled building programme becomes the prerogative of a testing department, the actual physical testing of appliances becomes of vital importance to everyone"—to the householder and to the manufacturer who must design and produce appliances to satisfy the testing authority. Such testing is not easy, but "it is not generally recognized outside the laboratory that temperature measurement still presents fundamental difficulties. Measurement of air flow, radiation, and accurate analysis of flue gases, particularly at the high dilutions encountered with open fires, all present problems which remain to be solved." Test results become empirical test bench efficiencies which may not represent practical results at all. Laboratory tests should be kept to the simplest level for the preliminary choice of appliances for practical home tests upon which the final selection should be based.

The purpose of the Paper is to initiate discussion with a view to the evolution of a reasonable and workable code of practice for the testing of solid fuel domestic appliances. To give reproducable results limits should be specified for ash and volatile content of coal, for which is suggested, ash not more than 8%, volatiles 15 to 25%. "The upper limit of 25% may be high for some coals, as it is important for domestic appliances that they should be at most only feebly coking." For coke, the C.A.B. value and bulk density are particularly to be noted and "it has been suggested that coke used for test purposes should have a bulk density of 21-26 lb./cu.ft. and a C.A.B. of 0.035 to 0.065.

The measurement of fuel consumption presents difficulties. "The erection of the appliance under a test on a sensitive platform scale seems to be the method capable of giving the most accurate results," but such a scale, which might have to deal with appliances weighing 12 cwt. or more, involves an expense which is only doubtfully justified. Timetables of intermittent and continuous burning tests are given. The fixing of "arbitrary dimensional standards" should be avoided. The specification of fire bars for open fires in B.S. 1251/1945 is criticized.

The reproduction of chimney conditions by mechanical means is practically impossible. The system used by the Authors shows a standard brick flue, 9 in. square, 12 ft. high, fitted to the appliance, terminating 2 ft. below a fan-aspirated hood. It is open to the criticism that abnormal flue draught conditions frequently occur in practice. The several methods of measuring radiant heat output are discussed and the BCURA radiometer is described and illustrated. Radiant heat output is a function of many variables and it cannot be assumed that it will be directly proportional to fuel consumption. With coke, efficiency tends to fall with increasing fuel consumption, with bituminous coal it rises sharply to a maximum which may be more or less prolonged, followed by a continuous fall.

Hot water output tests may show the maximum boiler output or the actual useful output; testing authorities seem to prefer the former, manufacturers the latter because it is the "tap efficiency" which concerns the user. The flow method prescribed in B.S. 1252/1945 is criticized on the grounds (among others) that it does not give any indication whether the boiler will give satisfactory circulation when connected to a storage tank, that it takes no account of the fluctuating heat output of, say, the open fire with boiler dependent on the fuelling cycle, and that it is not suitable for the very low performances of the overnight burning periods. The Authors describe an alternative method in which a standard copper storage cylinder fitted in a portable stand is used. "The results obtained give a lower efficiency than with the flow system—but they represent a true hot water output and can be quoted with confidence."

"It is generally conceded that the best method of testing an oven is to cook in it." Laboratory tests are briefly described, "but it is doubtful if any of them can yet be considered sufficiently developed to form the basis of an acceptance or rejection-test." Hotplate performance tests based on the boiling of water are also unsatisfactory because of the difficulty of observing the boiling point—a difficulty which is not removed by the use of thermometers in the water owing to convection currents.

Convected heat loss from free surfaces is most difficult to measure, the only method appearing to be the use of a calorimeter chamber or sealed room. Estimation of flue loss depends on analyses of the flue gases and the gas analyses of complex mixtures at low concentrations is not easy, particularly when the flue gases carry tar and other unburned solids. The Authors find that the Bone and Newitt is "the most generally useful instrument." Continuous CO_2 records are routine practice in their laboratory using a specially sensitive conductivity bridge. They find the instrument gives consistently accurate readings down to 0.75% CO_2 with none of the troubles usually associated with CO_2 recorders. But calculation of flue gas volume from CO_2 analysis "can rarely be justified, certainly not below 3 to 10%." Direct measurement calls for intensive research which would probably not be justified at the present stage.

When tests have been completed a heat balance should be drawn up. A typical balance is given for an open fire with convector air jacket and boiler, burning bituminous coal. The potential heat in the fuel can be measured within ± 2%, "but few, if any, of the heat output readings can be determined within ± 5%." The example shows heat output measured, 49% of heat input. Losses measured amounted to 39%, leaving 12% unaccounted for, of which it is claimed "a large percentage could be given to the useful heat." "A heat balance for cookers is more difficult to complete and few authorities would have the temerity to attempt it."

Finally, on the subject of amenity value, "if the public is to be made to have what is good for it, then to the manufacturer at least it seems necessary that some effort should be made to ensure that the public is first induced to believe that they like what others think to be good for them."

* Paper to the Institute of Fuel (Scottish Section)

Measurement of Temperatures in Gas Retorts*

Records at Selected Positions in or Near to the Retort Wall

By E. HEATON, Ph.D., A.R.I.C., and
A. T. GREEN, O.B.E. F.R.I.C.

(*Continued from p. 155*)

IN the measurement of temperature in the retort wall of a continuous vertical retort setting, the thermocouples were enclosed in sillimanite sheaths set in silicon carbide cement in the retort wall (Fig. 9) and spanning the flue. The sheath was sufficiently long for the open end to be flush with the outside of the end wall. The closed end was flush with the carbonizing face of the retort wall.

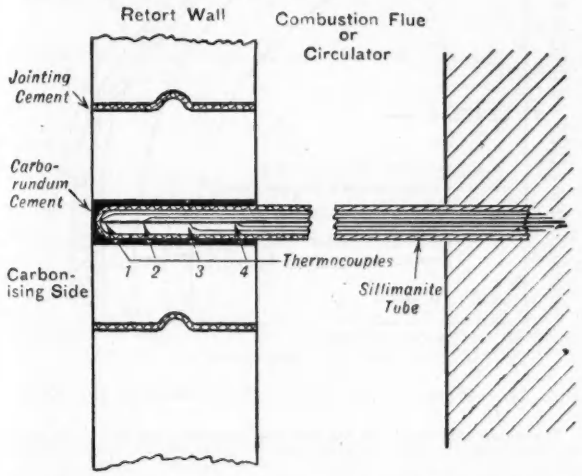

FIG. 9.—*Detail of Thermocouples and Sillimanite Tube in the Retort Wall.*

Four thermocouples were used in each unit which had a common positive lead. They were made of 30 s.w.g. platinum and platinum—13% rhodium wires, and the junctions were spaced approximately at 1 in. intervals. Thus Nos. 1 and 4 thermocouples were about 3 in. apart. The thickness of the wall of the sheath at the end was between $\frac{1}{16}$ and $\frac{1}{8}$ in. Hence No. 1 thermocouple was placed in the brickwork at this distance from the carbonizing face, while No. 4 thermocouple was situated in the brickwork $\frac{3}{8}$ in. from the flue side of the wall, the thickness of retort wall being $3\frac{1}{2}$ in.

Sets of thermocouples were placed at three levels in the retort wall, *viz.*:—3 ft. (level C), 9 ft. (level B) and 17 ft. (level A) from the top of the retort (Fig. 10). The second retort from the producer side of the setting was chosen as being representative of the average temperature.

Differential Expansion

In order to allow for differential expansion between the retort and the outside wall a space was left around the sheath as indicated in Fig. 10. This was sufficiently large to allow for any expansion, which would otherwise break the tube, and also to allow easy access when making the wall good later. This was done when the setting was almost up to carbonizing temperature. Care had to be taken to prevent cold jointing cement from coming in contact with the sillimanite tube as this tended to cause breakage through thermal shock. (If the sillimanite tubes become shortened through this or any other cause, manipulation of the couples is made difficult when replacements are necessary.)

A continuous record was made on a six-point recording galvanometer. For this part of the work Nos. 1 and 4 thermocouples only at all levels were used. As soon as additional recording facilities are available the temperatures registered by the other thermocouples will be recorded.

* From the 37th Report of the Refractory Materials Joint Committee : 1945-46.

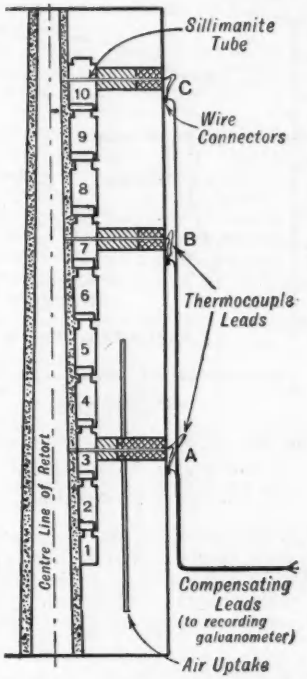

FIG. 10.—*Sectional Sketch of the Elevation of the Retort and End Wall of the Setting Showing the Position of the Thermocouples.*

The shaded areas were left open to allow for expansion during heating-up of the setting. The heavily shaded areas were made good when setting was up to temperature.

It was found necessary periodically to calibrate the thermocouples, especially those at the higher temperatures. As the units tended to be fragile due to the fineness of the wire, a case for carrying them was made from a 5 ft. length of $\frac{3}{8}$ in. gas piping, plugged at both ends.

Discussion of Results

The observations are divided into three sections, namely, the heating-up period, the working or gas making period and the scurfing period. These last two, the working and scurfing periods, are jointly referred to as the scurfing cycle.

The temperature of the setting was raised to above the cristobalite inversion point (about 220°C.) over a period of about 40 days from first putting in the fires. During this period recordings were made at the base of the setting in

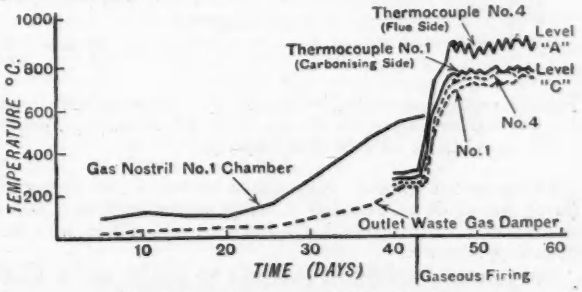

FIG. 11.—*Heating-up of the Setting.*

No. 1 combustion flue and the outlet to the waste heat boiler (Fig. 11). No measurements were made actually in the brickwork until shortly before gaseous firing.

Immediately prior to gaseous firing the temperatures at these points were 560° and 250°C., respectively, while temperatures recorded $\frac{3}{8}$ in. inside the retort wall from the flue (thermocouple No. 4) at levels A (No. 3 flue) and C (No. 10 flue) were 360° and 250°C. Thus there was a drop in temperature of 200°C. between Nos. 1 and 3 flues, and of 100°C. between Nos. 3 and 10.

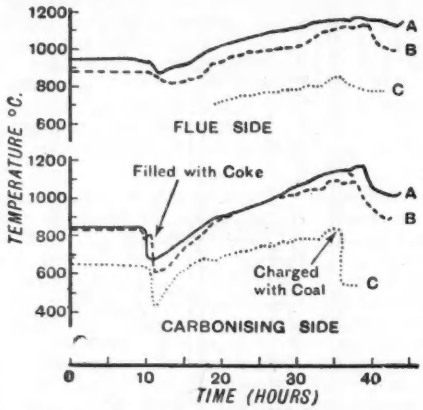

FIG. 12.—*Filling with Coke and Charging with Coal:*

(*a*) 17 ft. from the top of the retort.
(*b*) 9 ft. from the top of the retort.
(*c*) 3 ft. from the top of the retort.

On turning to gaseous firing, the temperature at level A rose to 900°C. and at level C to 760°C., over a period of four days. These temperatures were maintained for a number of days until the setting began to make gas. The carbonizing temperature was reached while the retort was charged with

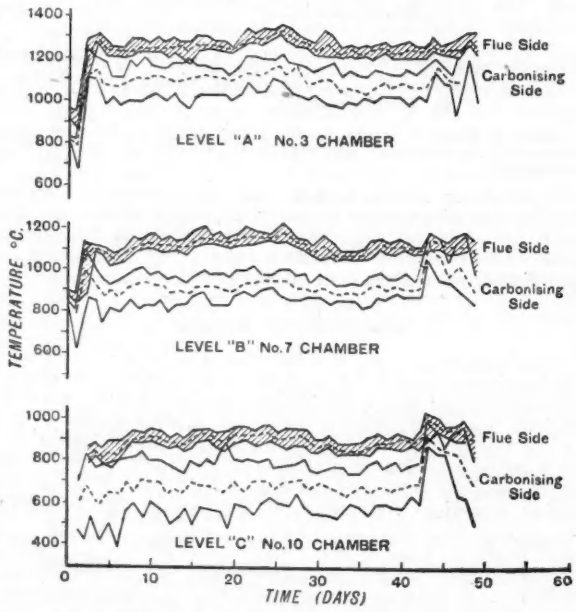

FIG. 13.—*Average and Limiting Daily Temperatures from Charging of the Retort to the First Scurfing Period (i.e., for One Scurfing Cycle).*

coke, *i.e.*, about 1,250°C. as measured by No. 4 thermocouple (level A). This represented a temperature between 1,300° and 1,350°C. as measured at a hot spot in the flue with an optical pyrometer.

Temperature fluctuations indicated by couple No. 4, level A (Fig. 11), were no doubt due to fluctuations in producer gas quality and quantity as would be caused by producer clinkering and nostril cleaning. The temperature gradients through the retort wall were 100°C. at level A, and 30°C. at level C (at flue temperatures of 900° and 760°C., respectively).

Filling the retort with coke (Fig. 12) resulted in a temperature drop of 150° to 200°C. on the carbonizing face. A corresponding drop in temperature of approximately 50°C. occurred on the flue side of the retort wall.

The working period was characterized by temperature fluctuations on the carbonizing face (or more accurately $\frac{1}{8}$ in. into the brick) of from 100° to 400°C., depending upon the

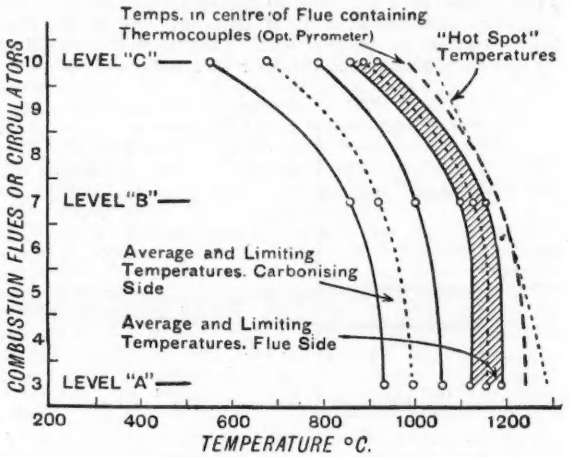

FIG. 14.—*Average Temperature Distribution in the Retort.*

The average of the maximum and minimum temperatures are plotted and not the actual maximum and minimum temperatures for the period represented by Fig. 13.

level. Fig. 13 shows the average daily temperatures on both sides of the retort wall at all levels for the working period, along with the limiting maximum and minimum temperatures.

In Fig. 14 the averages of these results are plotted against the height of the retort. The zones so formed represent the average total variations in temperature. Thus, at level A the temperature of the retort face will be, on an average, between 930° and 1,060°C., for a flue temperature of between 1,120° and 1,190°C. This neglects the temperature attained while standing full of coke, and the scurfing period.

The average temperature of the flue is also shown in Fig. 14, measured by an optical pyrometer at the point where the sheath enters the retort. For comparison the "hot-spot" or control temperature for a flue nearer the centre of the setting is given.

Generally speaking the temperatures of the flues next to the end wall tended to be rather lower than the average for the setting. This was so for the early part of the working period, but the temperature of the setting as a whole was decreased about half-way through while leaving the end flues unaltered. Thus the temperature measured in the centre of the flues containing the thermocouples was fairly constant, while the temperatures at corresponding places in the flues on the other side of the retort dropped from 50° to 100°C. higher to about the same temperature. The "hot-spot" temperatures were measured in this series of flues but only after the setting had been checked. The average "hot-spot" temperature was therefore lower than the average temperature measured in the centre of the flues for the whole of the working period, due to the higher temperatures over the first half. Hence the flue temperatures were only averaged out over the last part of the working period, from the 34th to 43rd days. The average "hot-spot" temperature was only 1,285°C. in the flue at level A, about 50°C. lower than the normal temperature used in this type of retort. Hence, to obtain a value for the temperature on the carbonizing face of a retort working at the higher temperature of, say 1,320°C., from 25° to 50°C. should be added, *i.e.*, some fraction of

the difference between the average "hot-spot" temperature in the end flues and the average "hot-spot" temperature for the rest of the setting.

The effect of the travel of the charge on the temperature can be seen in Figs. 15 and 16. Fig. 15 is a tracing from

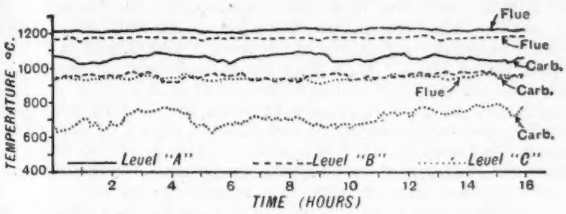

FIG. 15—*A Daily Record for All Three Levels.*

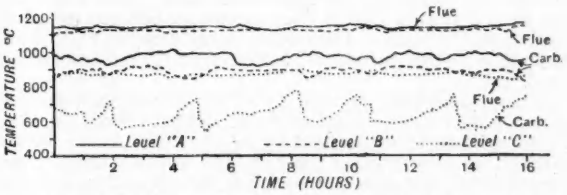

FIG. 16.—*Another Day's Record when the Charge is not Travelling Freely.*

the chart on a day when the coal travelled easily. Fig. 16, however, is a similar tracing when the charge proved more difficult. The increase in temperature variation is clearly brought out, particularly in the top of the retort.

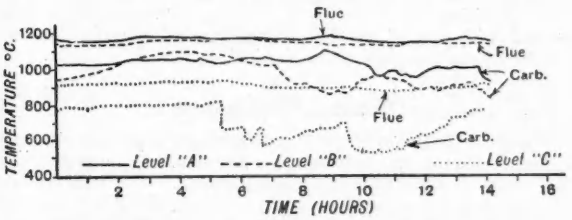

FIG. 17.—*A Record of a "Hanging" of the Charge Occurring just Above the Extractor.*

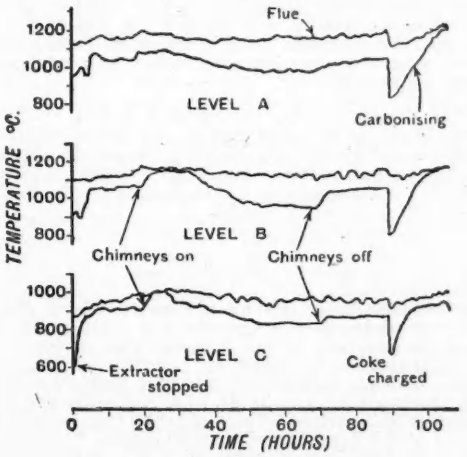

FIG. 18.—*Scurfing of the Retort.*

Fig. 17 is included to show the effect of the "hanging" of the charge low down in the retort. The temperature at the carbonizing face at all levels tended to rise steadily, due to the charge becoming static. This was particularly so at level B, where the thermocouple was possibly opposite to a cavity in the charge. Dropping of the charge resulted in a decrease in temperature, except at the top, where the temperature remained steady until the coal valve was opened, when the rush of cold coal into the top of the retort caused a sudden decrease in temperature.

The scurfing period is shown in Fig. 18. Shortly after the coal box was emptied the temperature at the carbonizing face of level C began to rise, followed by a rise in temperature at levels B and A as the carbonization was completed and the level of the charge fell. The flue thermocouples (No. 4 thermocouples) showed corresponding increases of temperature of between 50° and 100°C.

After 20 hr. the chimney was put on, which resulted in a rapid rise of temperature at levels B and C, but not A. This was due to the fact that scurf does not form so low down as point A.

This temperature was maintained for about 7 hr. for level C and 12 hr. for level B. After 30 hr. the temperature fell considerably, and then became steady. During this period the temperature at level A also fell, despite the fact that there had been no previous increase of temperature due to combustion of carbon. The reason for this was the cooling effect of the air admitted after the carbon was burnt off, as removal of the chimney and sealing of the retort resulted in a small rise in temperature.

The temperature then remained fairly constant until the retort was charged with coke, when a temperature drop of between 150° and 300°C. occurred.

Conclusions

(1) The average daily temperatures at two positions through the retort wall and at three different levels have been determined (Figure 14). One-eighth in. in from the carbonizing face, 3 ft. down the retort, the average temperature was 680°C. ± 120°C., while at 9 ft. and 17 ft. it was 920°C. ± 70°C. and 1,000°C. ± 60°C., respectively. These figures are rather low as flue temperatures over this period were lower than the average for this type of setting. To the average temperature at level A (17 ft. down) 25° to 50°C. should, therefore, be added.

(2) The above are average temperature variations. The maximum variations for the whole of the working period were ± 100°C. at 9 ft. and 17 ft. down the retort, and ± 225°C. at 3 ft.

(3) The daily temperature variations on the flue side of the retort wall were high as 50°C. This may be due to variations in the amount and quality of producer gas supplied to the setting.

(4) During scurfing the surface temperature approached 1,200°C., particularly about 9 ft. down. This was the area of maximum scurf formation.

(5) Charging of the retort with coke resulted in a temperature drop of 200° to 300°C.

Measurement of Temperature in the Charge of a Horizontal Retort

An iron sheath was used. It had an internal diameter of $\frac{5}{8}$ in. and was 12 ft. long. A piece was cut out of the bottom of the door of the retort, through which the tube protruded when the door was shut. Any gas leak was sealed with clay.

The thermocouples were in units of four with a common negative, the junctions being 1 ft., 4 ft., 7 ft. and 10 ft. from the retort mouthpiece at the discharging end. The temperatures were measured with a non-recording galvanometer.

Immediately after discharging, the sheath containing the thermocouples was laid on the floor of the retort with about 6 in. projecting beyond the mouthpiece, and connexions were made *via* compensating leads to the galvanometer situated in a convenient place, some distance away. The retort was then charged normally temperature measurements being made every 30 sec. until the retort was full. Readings were taken every 5 min. after this for the first 1½ hr. and afterwards every 30 min. for the rest of the carbonizing time of 12 hr. Before discharging, the sheath was withdrawn.

The results are presented in Figs. 19 and 20. They agree with observations made on works with regard to the temperature of coke at the time of discharging, which varies between 900° and 1,000°C. The minimum temperature measured, *i.e.*, when the retort was charged, for later experiments was as low as 150°C. and appeared to depend upon the moisture content of the coal.

The temperature variations in a horizontal retort synchronise with charging and discharging and hence are neither due to

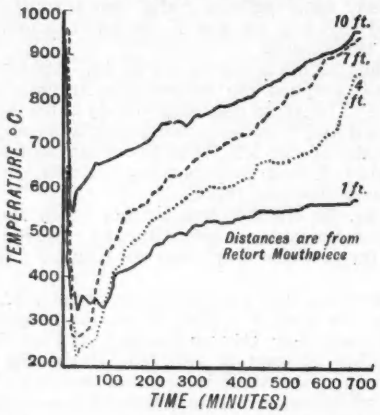

FIG. 19.—*Temperature Variation in the Charge of a Horizontal Retort Near the Floor During the Carbonizing Schedule.*

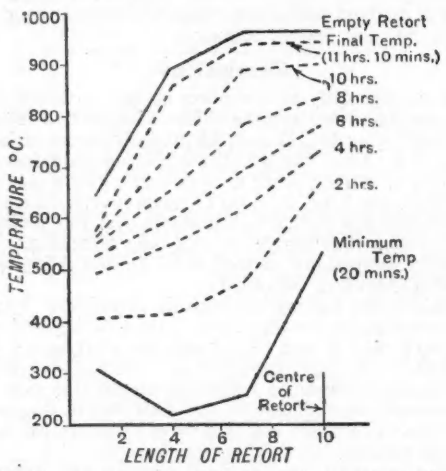

FIG. 20.—*Temperature Distributions Along the Length of a Horizontal Retort at Different Times During Carbonizing.*

the same causes nor are they as frequent as those in the top of a continuous vertical retort. Thus in the charge near the retort wall the temperature in a horizontal retort varied between about 200° and 950°C. twice a day.

General Discussion

The temperature surveys indicate the conditions in the retort itself at any particular level are constantly changing. The variation in conditions as reflected by the fluctuations in temperatures may have an adverse effect on the refractories.

The main failures occurring in a continuous vertical retort are, disintegration of the top fireclay, flaking of the silica in the upper portion of the retort, and slagging of the silica towards the bottom.

The average temperature 3 ft. down from the top of the retort in the top fireclay zone was found to be 680°C. with limiting temperature variations of ± 200°C. Thus the temperature at this level oscillated about the temperature of the quartz inversion point of 575°C. There is considerable doubt whether this temperature alternation is sufficient to cause disintegration of the firebrick even when it contains appreciable quantities of quartz, and further data will be necessary to place the matter beyond dispute. Until then the data available make the hypothesis tenable if not plausible.

The flaking in a gas retort has been attributed to the surface attack of the silica by alkali vapours and subsequent removal of the altered surface through alternations of temperature or by its adhering to pieces of scurf which detach themselves during the scurfing operation. However, in samples recently examined, there has been very little evidence of chemical attack. In the section of the retort where flaking is most severe (*i.e.*, from 6 to 12 ft. from the top of the retort), the average temperature was found to be 920°C. with limits of ±100°C. This is at a position $\frac{1}{8}$ in. within the brickwork from the carbonizing face. The temperature variation in the charge in contact with the face was found to be of the order of ± 400°C. Thus the carbon deposited on the walls may undergo temperature fluctuations of between ± 100°C. and ± 400°C. Silica above 600°C. has a very small coefficient of expansion, whereas for gas carbon it is of the order of $5{\cdot}4 \times 10^{-6}$. Thus there may be stresses set up between the carbon and silica leading to disintegration of the surface layers of the brickwork. Subsequent scurfing and the "curling off" of the scurf from the wall may finally remove the flakes. On the evidence rendered available this appears a reasonable hypothesis.

Seventeen feet from the top, in the zone where slag attack is prominent, an average temperature of 1,000° to 1,050°C. was found with limiting variations of ± 100°C. Stresses may arise in the surface of the silica work under these conditions due to lime-ferrous silicate slags alternating between the glassy and crystalline states. Fluctuation in temperature may, therefore, have an adverse effect on the refractory material in this zone.

It may, therefore, be argued that any alteration which will facilitate the free travel of the charge will have beneficial effect on the refractories throughout the retort. Such factors are the carbonizing properties of the coal, the working temperature, the efficiency of stoking, the design of the top casting to enable easy access for rodding and the free removal of the gas (*e.g.*, any passage of the gas through the uncarbonized part of the charge will result in condensation of the tarry matter and the formation of a crust), the taper of the retort, and the method of extraction.

Considerable work is necessary to ascertain the effect of these factors on the durability. Determination of their influence on the temperature conditions may shed some light so long as the connexion between durability and the temperature conditions is established. Further knowledge is also needed with regard to the temperature distribution on the horizontal axis as well as the vertical.

General Conclusions

The main outcome of the temperature surveys here reported is the disclosure that considerable fluctuations of temperature may occur at the surface of the brickwork. The temperature differences are ascribed to uneven travel of the charge, due to such causes as variation in coking properties of the coal used. They may be of different magnitude at different levels, but reasons are given for showing that the fluctuations may adversely affect the life of the refractory. However, knowledge of the temperature distribution is far from complete, and further data are required on the effect of varying conditions in one and the same and in different plants before it can be assumed that the tentative conclusions now advanced are generally applicable.

Thanks are due to Mr. J. E. Stanier, G.M., M.I.Chem.E., General Engineer and Manager of the Stoke-on-Trent Gas Department and his staff, for the valuable help they have given in this work; and to West's Gas Improvement Co., Ltd., and their staff, for co-operation and assistance in the conduct of the work.

With Only Eight Hours' Gas Storage Capacity at Leven Gas-works, the Gas Commissioners cannot proceed with a scheme for the provision of new gasholders because 16 householders occupy houses on the site earmarked for the scheme, and other houses cannot be found for them. This was the situation reported to Buckhaven and Leven Gas Commissioners last week by Mr. H. A. Aitken, General Manager. The Commission is composed of representatives from Leven and Buckhaven and Methil Town Councils, and Councillor Adamson, Leven, suggested that both Town Councils might help out by sharing the responsibility of rehousing the tenants, although all of them lived in Leven. Provost W. Slater said Buckhaven and Methil Town Council had not discussed the matter, and he could not commit the Council by expressing any view meantime. Provost Anderson said Leven would try to rehouse as quickly as possible whatever proportion of the tenants they had eventually to deal with, but he pointed out that that would take some time as not one new permanent house in Leven was yet ready for occupation.

Quartz in Fireclay Refractories

Discussion on the Paper by J. Sharp Smith and Peter F. F. Clephane (Gas Light and Coke Company) presented to the Autumn Research Meeting of the Institution of Gas Engineers. The Paper was published in the "JOURNAL" of January 1 and 8

MR. A. T. Green (British Refractories Research Association): Years ago, Dr. Mellor, when he talked to me about refractories, said on many occasions that whenever you are dealing with refractory materials you are dealing with the chemistry of arrested reactions. I have never known a refractory material which did not change in use; therefore, the changes which the Authors have brought forward are changes which we should have anticipated.

Semi-silica has had a vogue in the Gas Industry. In the old days, when I was concerned with this material, it was always indicated to me definitely that the contraction of the clay was counterbalanced by the expansion of the quartz. That may have been a bit of a fable, in the light of present knowledge, but I put it to you that semi-silica has done a reasonable job of work in the Gas Industry for a considerable time.

The first important point I want to make with regard to this Paper is that the materials "A" and "B" are materials of very high after-contraction. That is to say, they were inadequately fired. Also, the amount of fluxing ingredients, if you like to call them such, or constituents, in both materials is comparatively high; I estimated about 8% in one and about 6% in the other. Alumina and silica do not form an eutectic, except at about 1,515° C., which is a high temperature. The reactions which the Authors have been introducing to us are surely associated, first, with the vitrification due to the slow fusion of certain of the constituents which I have mentioned—micaceous matters, lime materials, magnesia materials—and it would have been better if the Authors had used a china-clay-quartz mix (china clay being as near as we can get to pure clay) and had heated it to a specifically high temperature, using it as the standard material, because I submit that the impurities present in the materials with which the Authors have dealt have had considerable significance in the results they have obtained. I also suggest that, had the materials been fired to a higher temperature, we should not have had quite the same curves that we have in the Paper with regard to the determination of refractoriness.

However, I will say that it is a great joy to see more of these Papers coming from gas undertakings. The more we can get the Gas Industry interested in this subject, the more we are likely to progress. It seems to me to be entirely wrong that practically all the Papers presented to this Institution in the past on the subject of refractories should have come from the Refractory Materials Joint Committee.

Undue Contraction

Mr. A. Edwards (Gas Light and Coke Company): Mr. Clephane has been associated with me at Beckton throughout most of the period marked by interest in refractory materials in the years following 1922. Early in our work we were faced with the unwelcome consequences of the reaction between fireclay and quartz. I am speaking about refractory materials as applied, and not pure china clays and quartz. Jointing material disappeared at combustion chamber temperatures of 1,400° C. The cement was crushed quartz rock with 15%-20% of clay; the glassy matrix produced was absorbed in the pores of the brickwork. The only trace left to substantiate the claim that jointing material had been used was the characteristic appearance of the impregnated brick surfaces.

Producer arch blocks which partially supported the combustion chamber cross-walls of horizontal settings contracted unduly without losing shape and let down the cross-walls, necessitating a shut-down and the replacement of the blocks and walls. To secure stability, it was decided to exclude combined alumina. As a first approximation for general purposes, we called for silica containing not more than 10% of clay, and fireclay containing not more than 10% of quartz. These were considered to be generous limits, and were tightened up for specific purposes, particularly for jointing material. While we are convinced of the undesirable nature of material outside those limits, it is not always possible to convince others.

A glance at the melting point curve of the silica-alumina system points to the presence of an eutectic or lowest melting ratio with 5.5% of alumina and 94.5% silica, which is 160° C. below the melting point of pure silica. This low point occurs in the belt of composition assigned to siliceous materials. Beyond this belt, on the rising curve towards pure alumina, we pass through the fireclay range, the centre of which is approximately level on the temperature scale with pure silica.

The actual magnitude of the intermediate points between those of the pure constituents is greatly influenced by the presence of small quantities of impurities such as soda, potash, lime, magnesia, and titanium, which can reduce the eutectic point of 1,545° C. to below 1,200° C., depending upon their magnitude. Additions of fireclay to quartz, or of quartz to fireclay, must inevitably risk the production of this lowest melting constituent. By close inspection of the curve one can conclude that not more than 2% of alumina should be present in silica or 4% of quartz in fireclay, if the best results from the refractory point of view are required.

It may be asked whether these mixtures as they occur in siliceous materials must necessarily react to give the lowest melting product. In spite of the fact that the Authors point out that the origin of the quartz has a marked influence upon the rate of the reaction, it will surely take place. A conclusive piece of evidence of the general truth of this view was provided by the B.R.R.A. about 1939, when the attack of blast furnace slag upon fireclay was examined.

A valuable feature of the Paper is the recognition that the reactions taking place between clay and quartz are comparatively slow, and will not have any prominence in short laboratory heatings. A maintained temperature treatment for as long as four weeks, during the last week and a half of which no observable change occurred, carried conviction that finality had been reached.

Value of Spalling Test

Another feature of value is the inclusion of a spalling test in which the quartz-clay brick disintegrated, whereas normal fireclay suffered little injury. I would draw particular attention to the remarks regarding the behaviour of material "A." At the end of the third cycle of heating and cooling, the heated ends of the specimens disintegrated under slight finger pressure. In the 37th Report of the Refractory Materials Joint Committee, on "The Measurement of Temperature in Gas Retorts," it was reported that the temperature in the top fireclay zone of a vertical retort oscillated about the $\alpha\beta$ inversion point of quartz, and the disintegration of the surfaces occurred. The Assistant at Stoke said, "It can be crumbled away by the fingers." The similarity in the condition of the siliceous material after the spalling test by the Authors and of the fireclay after service observed at Stoke suggests strongly that quartz has been present in the material of the vertical retort section to a degree comparable with the Authors' "A" material. Messrs. Heaton and Green doubted that quartz inversions could account for the disintegration observed; but the forthright observation that it occurred with siliceous material but not with normal fireclay in an ordinary furnace should clinch the matter. The use of a straight fireclay from which quartz has been rigidly excluded from the green stage is indicated for better service in the top of vertical retorts.

The presence or absence of quartz in fireclay can be settled simply and quickly by the use of the microscope, as indicated in Plates 3a-3e, but using powder instead of ground sections. Increments can be examined as fast as the material can be collected and ground. If there has been any marked solution of quartz, the effect can be noted by the degree to which the refractive index has been reduced below 1.56 towards the apparently limiting value of 1.50—a very marked change.

Material "C" has always presented a problem in the laboratory, due mainly to the unreactive nature of the silica sand from which it is made. While it is true that the material will show an excellent record in use, it must not be forgotten that there is a most unwelcome tendency to acquire a coating of slag from furnace gases which in horizontal retorts slowly drips upon the producer arch and blocks up the gas and air nostrils, whereas 96% silica is free from that tendency. Material "C," with its border-line composition, cannot be treated and judged in the laboratory by the standards suitable for traditional 96% silica, for which it can be substituted for retort work but for the slag reservation just mentioned. In a similar way, quartz-clay mixtures cannot conform to tests that are suitable for a straight fireclay. Large and variable results in the determination of permanent linear change on reheating are inevitable. The formation of the fluid eutectic at the interfaces of quartz and clay must result in a drawing together of the solid particles due to surface tension forces. The degree to which the contraction develops will depend upon the variable consolidation of the material. The compact structure of material "C" is excellent and will limit such movement.

Effect of Wetting

The force developed by wetting is not always realized. A familiar experiment is to fill a container with sand, tamping it down to a point where the volume is stable and refuses to give further. If the mass is now damped with water, subsidence at once follows. Surface tension within the mass thus accomplishes more than outside force in consolidating the grains. The effect is large with loose grains, but it is quite measurable when vitrified building material is wetted. Siliceous mixture, due to its texture, falls between those cases in its response. That such an inward force is responsible for the contractions observed when eutectic temperatures are reached is supported by the fact that in many cases of even gross contraction—in one case

the NEW *established*

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amounting to 2½ in. in an 18 in. length—the material keeps a perfect shape with clear-cut edges, and only the foot rule indicates the failure. Where the indications of the foot rule can be disregarded, siliceous material might serve some useful purpose.

The inclusion of cavities in the quantitative survey by the method of linear intercepts is unusual. These figures of areas should represent volume percentages, and if so the cavities should be equal in extent to the porosity. On scanning the figures for cavities the impression is that they fall far short of the known porosities; material "A" with 9%, "B" with 8%, and "C" with 11% are all well below the apparent porosity, which would scarcely be less than 20%. In other words, something over half the pores lurk behind the other areas, and to that extent can falsify the quantitative significance. The comparative effect of the treatments at increasing temperatures, however, leaves no doubt as to the drift of the reactions, which could not have been shown with the same clarity in any other way.

Fundamental Work

Dr. **A. L. Roberts** (University of Leeds): The Authors have clearly demonstrated that, under certain conditions, the high-temperature reaction between the quartz and the matrix of a siliceous refractory can take place progressively over long periods of time, with consequences that might be serious in practice. The work is opportune, especially as it emphasizes the practical significance and aims of the fundamental study of changes in clay-quartz systems on continued burning, which is now being prosecuted actively on behalf of the Joint Refractories Research Committee. In this work, attention is being paid to the fundamental changes taking place in the first instance in the materials. Later—and this work is about to start—the effects of adding fluxes, and particularly alkaline fluxes, will be taken into account, and I think the work will yield useful results.

The microscope, an important tool in dealing with changes taking place in refractory materials, has always been fully employed as an investigational tool by the refratories specialists of the Gas Light and Coke Company, and it has been put to good use in the present case to show the nature and extent of the changes occurring in three types of material. I do not think there is any doubt that the Authors' experimental investigation of these changes is valid, and it is particularly valuable to have a Paper of this sort, in which the users' point of view is expressed definitely for the information of the manufacturer as well as in the interests of other users.

But in the interpretation of the results obtained by these various methods I should like to point out, as did Mr. Green, that theoretically the reaction, or the so-called reaction, between clay and quartz would take place at higher temperatures than the Authors have been concerned with, unless, of course, the influence of impurities, and particularly alkaline fluxes, brought the temperature of rapid reaction down to the temperature range in which they have been interested. I think the agents responsible for reaction with quartz are, not the clay itself, but the associated fluxing minerals, particularly the alkali-bearing impurities; and I think the observed effects can be explained on this basis. Material "A" is abundant in quartz; it also has a large clay content, together with a high proportion of associated fluxes. Material "B" is rich in quartz and, to judge from the probable constitution, contains much more of this mineral than has been estimated by the Authors. This is proably due to a substantial proportion of fine quartz grains, which would not be taken into account by the microscope method if below a certain size. In addition, material "B" is rich in fluxes, despite a lower total clay content than that of material "A." Material "C," although very rich in crystalline silica, has a small content of fluxes and no alkalies whatever. In my view, these are the reasons for the reactivity of materials "A" and "B," and the relative stability of material "C."

From this point of view it is clear that the alkali and flux content of siliceous materials is important in regard to their behaviour in service. I sould like to see aditional tests on siliceous materials made from clays containing the minimum quantity of fluxes. Tests on mixtures of pure kaolinite and quartz are in hand in our laboratories, and work has now commenced on the effect of fluxes added to such mixtures. The point raised by Mr. Edwards regarding the effect of the grain size of the quarts on its reactivity is certainly being borne in mind in our work, which is designed to demonstrate this particular effect, among others. I think there is no question but that the grain size of quartz has a very marked influence on the reaction with the associated minerals in the clay.

Cleaning Small Coals*

By J. HOWARD GRIFFITHS, M.Sc., Ph.D.

(A "Gas Journal" Abstract)

THE chief characteristics of raw coal from the point of view of cleaning are (a) the size distribution—particularly the amount of fines less than ⅛ in., (b) the amount and distribution of the ash, (c) the percentage of moisture. There is a lack of reliable statistics relating to the size distribution in the country as a whole but many individual collieries have such data relating to their own product and it is now generally accepted that there has been an appreciable degradation in the sizes of run-of-mine coal. Reasons given are the increase of machine mining, the use of cutters in thin seams, rougher handling on jigger and belt conveyors and the mechanical loading of trains. Further degradation will follow the use of cutter loaders and perhaps coal ploughs at the coalface and the use of skipwinding for bringing the coal to the surface. With the increase of demand for small coal the system of payment has been changed from a basis of tonnage of large coal to one of gross tonnage. Increase in the percentage of smalls overloaded preparation plants and increase in refuse entrained in the clean coal resulted. In too many cases nothing has been done to reduce overloading, and consequently the quality of the cleaned coals and the efficiencies of the plants are reduced.

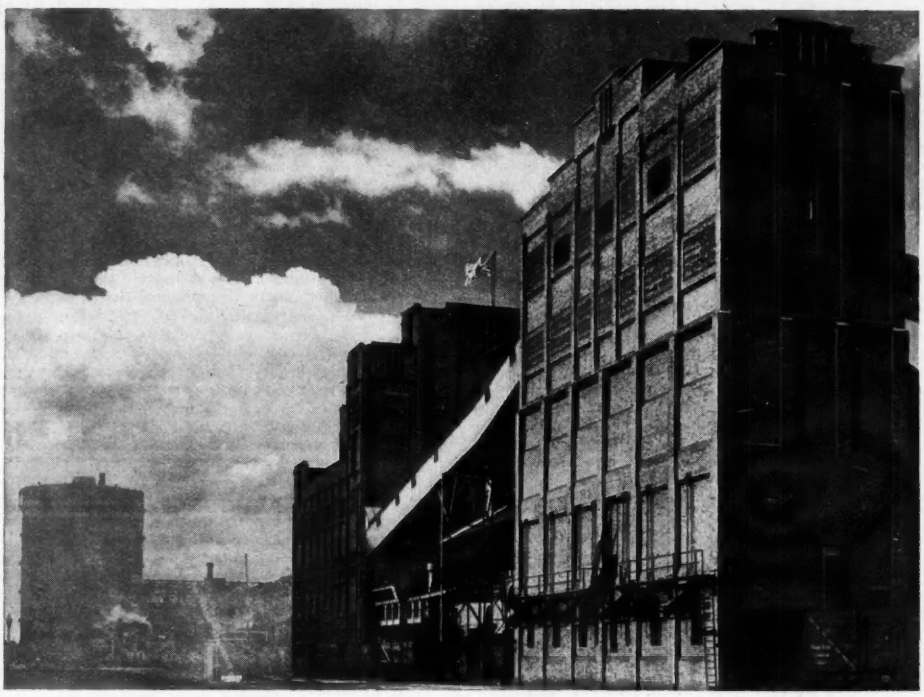
Tonnage of coal raised and weighed and that of saleable coal produced in South Wales is graphed for the years 1930 to 1945. In 1930 the output raised was 46 million tons of which 45 millions was saleable, whereas in 1945 the output raised was 23 millions of which only 20 millions was saleable. This degradation is attributed to (1) increased mechanization of the coal-getting operations, (2) the poorer quality of the seams worked, becoming economically possible by machine mining methods, (3) increased percentage of coal washed resulting in refuse previously sold being rejected, (4) the psychological effect of men working in large teams, as on conveyor faces, where it is impossible to trace the filling of dirt to the individual workmen.

The effect of the increase of refuse raised on preparation plants is illustrated by the statement that, 15 years ago, plant designed to handle 115 tons of raw coals produced 100 tons of clean coal and rejected 15 tons. To-day, to produce the same tonnage of clean coal, it must handle 125 to 140 tons of raw coal and 25 to 40 tons of refuse.

The percentage of moisture is increased by the necessity for the application of water at the coal face to reduce dust and to remove the cause of dust diseases. Moisture content of ⅜ in. slack may rise to 10 or 12% free moisture. The use of water for dust suppression reduces the effectiveness of screens. With present designs screening can be efficiently carried out at ⅜ in. on coals containing up to 4 to 6% moisture, but 3 to 4% gives trouble at ⅛ in. and coals become unscreenable at 8%. Wetting agents used in wet cutting have reduced the quantity of water necessary. Soap compounds are those recommended, but even so coal cleaning plant must be prepared to deal with coals containing up to 10% free moisture. Several possible ways are described of dealing with moisture difficulties. The obvious solution is to dry the coal prior to screening, but the cost of this is prohibitive except in exceptional cases and research work is needed to arrive at the design of economical plant. Jig washers of the Baum type are not unduly affected, but cleaning is greatly facilitated by the removal of fines before washing. Fines are also removed by pre-screening for the gravity type washers. Wet screening has been tried. Recent developments may solve these problems. The Sy-Vor process, described and illustrated, can separate fine particles of the same size but different densities and may rival froth flotation as a method of cleaning the super-fines. The Cyclone washer may be used as an alternative for washing the ⅜ inch to zero fraction. Lastly there is the Laminar Flow washer, developed in Germany for the production of ultra-clean coal. It is a gravity-type washer employing a suspension of magnetite, making use of its magnetic properties, to recover it on a belt passing over a magnetized drum.

"No mention has been made of the changes in the demands of the markets, although it is realized that no coal cleaning problem can be solved without due consideration being given to them."

* Paper to the Institute of Fuel (South Wales Section)



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COMMUNICATION No. 230—PROCEEDINGS OF THE INSTITUTION OF GAS ENGINEERS, 1939-40.

In this photograph of the fourth Installation of Glover-West Vertical Retorts at the Foleshill Works, Coventry, the coke storage hoppers with screening plant above are seen in the foreground. The retort house lies to the left. Space between is reserved for the duplication of the carbonizing plant. The project for the complete installation is sketched below.

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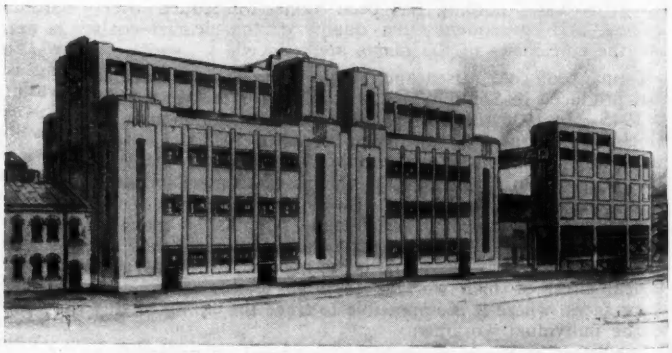

Publications Received

The basis of the fuel efficiency campaign during the war was to make the best use of the fuels and plant available, but the end of the war brought the possibilities of reconstruction and development of new plant to the fore. A 52-page book entitled *Fuel Economy Since* 1939, the contribution of the British National Committee of the World Power Conference, has been published and constitutes preparatory material for the Fuel Economy Conference of the World Power Conference to be held at the Hague in September, 1947. The book deals with the restrictions controlling the supply position, the conditions which gave rise to the need for a campaign, its organization, the publicity used and the results achieved. Both industrial and domestic fields are examined with a view to improving efficiency and such subjects as combined power and heating, utilizing back pressure or pass-out steam, correct design and insulation of furnaces, the recovery and utilization of waste heat, and the value of steam links between factories are discussed. The book is published by the Central Office of the World Power Conference, 36, Kingsway, W.C.2. The price is 1s. 6d. net.

* * *

An attractive brochure from the Templewood Engineering Co., Ltd., describes and illustrates every type of apparatus necessary in precision heating for light alloys. The gas- and oil-fired lift-out and bale-out furnaces consist of a pot which may or may not be removed for casting purposes, surrounded by a refractory and insulating setting. The fuel is burnt in the annular space between the setting and the pot, the burners fire tangentially into this space and a violent swirling action is set up, increasing heat transfer and reducing hot spots to a minimum. The metal in the pot is usually raised to a maximum "superheat" temperature of about 900° C., in the case of magnesium melting. If the metal is maintained molten in the pot for some time, *i.e.*, in a bale-out furnace, it is necessary to provide protection over the metal surface to prevent excessive oxidation. The magnesium bale-out furnace is fitted with a hood supplied with sulphur dioxide gas, while the combustion gases are used to form a gas curtain over the working opening. For lift-out furnaces a specially designed removable pot cover diverts a portion of the combustion gases over the surface of the metal during melting to perform the same function and also to increase heat transfer. The burners are of a type which can be set to maintain a slightly reducing atmosphere in the combustion space, thus minimizing oxidation of the outside of the pot. The pots are of graphite for aluminium and special alloy casting for magnesium.

Company News

Broom and Wade, Ltd.—Net profit for the year ended Sept. 30, before taxation, was £199,180, compared with £276,285 for the previous year. The ordinary dividend is maintained at 22½%, with a final of 15%, against a final dividend last year of 11¼%.

Gas Products Prices

The London Market

Jan. 17.

There are no changes to report in the prices of Coal Tar products in the home market, current values being as under:—

Ball and *Flake Naphthalene* from £26 15s. per ton in 2 cwt. single bags to £29 15s. per ton in 1 cwt. cases; minimum 4 ton lots delivered address in England and Wales.

Briquetting *Pitch* is 75s. per ton in bulk ex makers' works.

Road Tar is 5½d. per gall. filled into buyer's road or rail tanks and 5⅝d. per gall. filled into buyer's barrels at seller's works.

Creosote for timber preservation is 5½d. per gall. in bulk ex sellers' works in minimum 800 gall. lots.

The prices for *Cresylic Acid* range from 3s. 6d. to 5s. per gall. according to grade, ex makers' works.

Coal Tar Naphtha prices range from 1s. 11d. to 2s. 11d. per gall. and *Xylol* prices from 3s. 3½d. to 3s. 6d. per gall., carriage paid buyer's address in bulk in 1,000 gall. lots.

The Provinces

Jan. 21.

Average prices for gas-works products: Pitch, 75s. per ton; toluole, naked, North, 90's, 2s. 4d. to 2s. 6½d. per gall.; pure, 3s. 2½d. Prices for carbolic acid 60's, anthracene, creosote oil (hydrogenation), coal tar oils (timber preservation, &c.), and strained anthracene oil are controlled by Government Orders. Prices for road tar were increased by a half-penny per gall. by S. R. & O. 1945, 229, under which Order there was also an increase of 5s. per ton in the price for standard creosote-pitch mixture.

Scotland

Jan. 17.

Home demand is substantial and export business will be affected accordingly.

*Refined Tar.** Yield to the distiller is 5d. per gall. ex works, naked. *Creosote Oil.* Timber preserving quality* 5½d. to 6½d. per gall.; Hydrogenation Oil* 5⅞d. per gall.; Low Gravity or Virgin Oil† 7½d. to 7½d. per gall.; Benzol Absorbing Oil 6½d. to 8d. per gall. *Refined Cresylic Acid* is 3s. 6d. to 4s. 6d. per gall. ex works, naked, according to quality. *Crude Naphtha*† 7d. to 8d. per gall. *Solvent Naphtha.** Basic maximum prices delivered in bulk 90/160 grade, 2s. 10d. per gall. and 90/190 Heavy Naphtha, Unrectified, 2s. 0½d. per gall.; Rectified, 2s. 4d. per gall. *Pyridine*† 90/160 grade 15s. per gall., and 90/140 grade 17s. per gall.

* Price controlled. † Controlled.

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